Prepared by:
The Dredged Material Management Office
Seattle District, U.S. Army Corps of Engineers

MEMORANDUM FOR RECORD June 15, 2019

SUBJECT: SUPPLEMENTAL DETERMINATION REGARDING THE SUITABILITY/UNSUITABILITY OF PROPOSED DREDGED MATERIAL FROM BELLINGHAM COLD STORAGE, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR UNCONFINED OPEN-WATER DISPOSAL AT THE PORT GARDNER NONDISPERSIVE SITE.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers [USACE], Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability/unsuitability of 4,382 cubic yards (cy) of dredged material from the Bellingham Cold Storage (BCS) berthing area for placement at the Port Gardner nondispersive open-water dredged material disposal site.

2. Background. BCS is located in Squalicum Creek Waterway, Bellingham (Figure 1). Sediment characterization of the entire waterway, including the BCS berthing area, was conducted by USACE in 2016-2017 (Herrera, 2017). The waterway and berthing area were divided into two subareas, each with its own rank based on historical data. Subarea A, ranked low-moderate, encompasses the majority of the waterway. Subarea B, ranked high, is located at the head of the waterway. A DMMP suitability determination memorandum (SDM), based on the results of the 2016-2017 characterization, was signed by the DMMP agencies on May 3, 2017 (Attachment 1; DMMP, 2017a). All of Subarea A was found suitable for dispersive disposal, while Subarea B included a mix of suitable and unsuitable material. The suitability of some of the dredged material management units (DMMUs) from Subarea B for nondispersive disposal depended on the volume-weighted average (VWA) dioxin concentration for that portion of the dredged material being taken to a nondispersive site. At the time of signing, neither USACE nor BCS had finalized their maintenance dredging plans, hence the VWA could not be determined. The SDM, therefore, described the data collected and evaluated the suitability/unsuitability of individual DMMUs for open-water disposal, but could not provide project-specific evaluations until dredging plans had been formulated.

   In October 2017, BCS submitted a plan to dredge that portion of their berthing area falling within Subarea A. The DMMP issued a supplemental suitability determination for that dredging on November 9, 2017 (Attachment 2; DMMP, 2017b). Dredging took place in January and February of 2018, with placement of 11,637 cy at the Rosario Strait dispersive site.

   On May 7, 2019 (revised June 10, 2019), BCS submitted a plan to dredge that portion of the berthing area falling within Subarea B (Attachment 3; WSP, 2019). The SDM described the requirements the dredge design in Subarea B would need to meet for the dredged material to be eligible for open-water disposal. This memorandum supplements the May 3, 2017 SDM by documenting the evaluation of the dredge design in Subarea B vis-à-vis the requirements stipulated in the SDM.

3. Project Description and Summary. A plan view of the proposed BCS dredge plan is provided in Figure 2. Sectional views are provided in Figures 3 through 6. The plan calls for dredging to -30 feet (ft) mean lower low water (MLLW) (including overdepth and advanced maintenance) between Station 6+22 and 7+25. A transition slope will begin at Station 6+22 and daylight at Station 5+60. The dredge prism includes 169 cy of material that was found unsuitable for open-water disposal; 2,283 cy that were found suitable for dispersive or nondispersive disposal; and 1,930 cy that were potentially suitable for nondispersive disposal depending on the VWA (DMMP, 2017a). Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Subarea B: high
Proposed dredging volume	4,382 cy
Proposed dredging depth	-30 ft MLLW (including 2 ft of advanced maintenance and 2 ft of overdepth)
DMMO tracking number	SQUAL-A-378-16
EIM Study ID	SQUAL16
USACE Permit Number	NWS-2017-0301

Note: The project stationing for the federal navigation project has changed since the time of the May 3, 2017 SDM. The old stationing is used in this supplemental suitability determination. However, to facilitate review of the BCS dredging in relation to the federal project, Table 2 provides the dredging specifications in both the old and new stationing. Tables 3 and 4 also include both the old and new stationing.

4. Requirements from the SDM. As indicated previously, the SDM included requirements that need to be met by the dredge plan in Subarea B. These are as follows:

   a. The dioxin concentration of each individual DMMU taken to the Rosario Strait site must be at or below 4 ng/kg TEQ without volume-weighted averaging.

   b. The VWA dioxin concentration for dredged material taken to the Port Gardner site must be at or below 4 ng/kg TEQ.

   c. One-foot vertical buffers between suitable and unsuitable material and between material suitable for dispersive disposal and material suitable for nondispersive disposal must be incorporated in the dredging design at the discretion of the DMMP agencies.

   d. Where possible, dredged material taken to the Port Gardner site must be sequenced, with material with the highest dioxin concentrations disposed first and dredged material with the lowest dioxin concentrations last.

   e. The State of Washington's antidegradation standard must be met. This may mean leaving a one-foot vertical buffer of suitable material in place over sediment that does not meet the standard, or placing a one-foot clean sand cover following dredging.

   f. Side slopes of the dredge design may not cut into unsuitable material or material that does not meet the antidegradation standard, unless the area of exposed surface is determined to be insignificant by the DMMP agencies.

5. Meeting the Requirements. The ability of the dredge plan to meet each of the requirements in the SDM is evaluated in the following:

    a. None of the material from Subarea B will be taken to the Rosario Strait site.

    b. Table 3 shows the volume and dioxin concentration for each of the DMMUs included in the dredge plan. Volumes were calculated using bathymetry from a hydrographic survey conducted in March 2018. A contingency factor of 25% was added to cover any additional sedimentation that may occur between the time of the hydrographic survey and the time of dredging. The dioxin concentrations are from the SDM.

    The 169 cy of unsuitable material from DMMU LBB(N) (Station 5+82 to 5+60) will be dredged and disposed upland. In order to ensure that no unsuitable material is taken to an open-water site, a five-foot horizontal buffer must be included south of DMMU LBB(N) (i.e. to Station 5+87), with material dredged from this buffer disposed upland. In addition, there is a small volume of suitable material underlying DMMU LBB(N) that falls within the dredge prism (Figure 3). However, it is not feasible to dredge this small volume separately from DMMU LLB(N). Therefore, the DMMP agencies are requiring all material dredged north of Station 5+87 to be disposed upland. The remaining material will be taken to the Port Gardner site. As shown in Table 3, the VWA dioxin concentration for material planned for disposal at the Port Gardner site is 3.8 ng/kg TEQ, which is below the disposal site management objective of 4 ng/kg TEQ.

    The volumes in Table 3 were calculated under the assumption that USACE will conduct maintenance dredging of the federal project prior to the BCS dredging. The VWA dioxin concentration for the BCS dredging was also calculated for a scenario in which the BCS dredging is completed before the federal maintenance dredging. In this scenario (Table 4), the dredge volume increases by 254 cy, but the VWA remains the same, at 3.8 ng/kg TEQ.

    Note: Minor errors involving the dioxin concentrations for four DMMUs were found in the SDM. These errors have been corrected in Attachment 1 and in WSP (2019).

    c. With one minor exception, the dredge plan leaves a 1-ft vertical buffer between suitable and unsuitable material, as shown in the cross-sections in Figures 3 through 6. For example, as shown in Section A (Figure 3), the dredge cut leaves a minimum of 2 ft of suitable material overlying the unsuitable material in DMMU LBBS2(N).

    The exception is shown in Section D (Figure 5). The toe of slope along the northwest side of the berthing area (parallel to the channel) was set back 5 ft from the channel line (see Figure 2) to prevent the side slope from intersecting unsuitable material in DMMU AMB1. If all of the overdepth and advanced maintenance material is dredged, only 6 inches of suitable material will remain in place along the outer edge of AMB1. Further narrowing of the berthing area to increase the vertical buffer is undesirable from an operational standpoint. Since a 1-ft cover over AMB1 will be present within a foot of the toe of slope (given a side-slope ratio of 2V:1H), the DMMP agencies agreed this minor deviation was inconsequential and could be approved.

    None of the material from Subarea B will be taken to the Rosario Strait site, so the requirement for vertical buffers between material destined for dispersive vs. nondispersive disposal is not applicable.

d. As can be seen from the cross-sections, the dredge prism is a mix of material with dioxin concentrations less than 4 ng/kg TEQ (green) and between 4 and 10 ng/kg TEQ (blue). It is not feasible for the dredging contractor to attempt to sequence the dredging and disposal such that material with concentrations above 4 ng/kg is disposed first and material with concentrations below 4 ng/kg is disposed last.

e. The State of Washington's antidegradation standard will be met in Subarea B. With the exception of unsuitable DMMU LBB(N), the surface to be exposed by dredging will be within DMMUs that are suitable for open-water disposal. In most cases, the DMMUs exposed by dredging will have lower dioxin concentrations than the existing surface. For example, as can be seen in Section A (Figure 3), removal of the dredge prism will primarily expose material with a dioxin concentration less than 4 ng/kg TEQ.

   With respect to the unsuitable material in DMMU LBB(N) that will be removed and disposed upland, an unsuitable surface will be replaced with a surface that is partially unsuitable (i.e. the undredged portion of LBB(N) – red) and partially suitable (LBBS1 – green). Because the new surface will not be degraded relative to the existing surface, the DMMP agencies determined that the partial removal of LBB(N) meets the antidegradation standard.

f. The dredge prism was designed such that the side slopes will not cut into any unsuitable material, with the exception of LBB(N), which is being disposed upland. The cross-sections in Figures 3 through 6 show this to be true.

6. Supplemental Suitability Determination. This memorandum documents the evaluation of the suitability/unsuitability of sediment proposed for dredging from the BCS berthing area for open-water disposal. The 169 cy of material planned to be dredged from DMMU LBB(N) (Station 5+82 to 5+60) are unsuitable for open-water disposal and will be disposed upland. To ensure that all unsuitable material is disposed upland, the DMMP agencies are requiring all material dredged north of Station 5+87 to be disposed upland. The remaining 4,213 cy (4,467 cy if BCS is dredged before the federal project) are suitable for open-water placement at the Port Gardner nondispersive site.

   The unsuitable material must be dredged and transloaded before the rest of the project may be dredged. Once it has been verified that the unsuitable material has been removed, the remaining sediment may be dredged and placed at the Port Gardner open-water disposal site.

   This suitability determination does ***not*** constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

   A pre-dredge meeting with DNR, Ecology, EPA and USACE is required at least 7 days prior to dredging. A dredging and disposal quality control plan must be submitted to the Regulatory Branch of the Seattle District Corps of Engineers at least 7 days prior to the pre-dredge meeting. The quality control plan must clearly show how the unsuitable material will be dredged and managed separately from the suitable material. Dredging, positioning, de-watering, transloading and disposal will all need to be addressed with enough detail to provide assurance to the agencies that the dredge plan will be properly implemented. The unsuitable material must be completely dredged and

removed before the suitable material may be dredged and taken to the Port Gardner site. A bathymetric survey will be required after the unsuitable material has been dredged to verify that it has been completely removed.

In addition to addressing the dredging of the unsuitable material, the quality control plan must include: the equipment and vessels to be used, operational controls to ensure dredging accuracy, disposal positioning procedures for placement at the Port Gardner site, spill control and response measures, water quality monitoring, contingency plans in the event water quality standards are exceeded, debris management, personnel and responsibilities, dredging and disposal schedule, report submittals, agency contact information and coordination procedures. For this project, dredged material destined for disposal at the Port Gardner site must be passed through a 1 ft x 1 ft grid prior to placement in the dump barge (DMMP, 2015). Debris is to be disposed at an upland location. The quality control plan must be approved by USACE, EPA, DNR and Ecology prior to commencement of open-water disposal. A DNR site-use authorization must also be acquired.

7. Recency Extension. The recency period for Subarea B expires in December 2019 (DMMP, 2017a). Dredging of the BCS berthing area might not occur until January or February 2020. There is no reason to believe that conditions in the waterway will change between December 2019 and the end of the in-water work window in February 2020. Therefore, the DMMP agencies are in agreement that a recency extension to the end of the work window is acceptable.

8. References.

DMMP, 2015. *Debris Screening Requirements for Dredged Material Disposed at Open-Water Sites.* A DMMP Clarification Paper prepared by Erika Hoffman (EPA), Celia Barton (DNR) and David Fox (USACE) for the 2015 Sediment Management Annual Review Meeting, October 2, 2015.

DMMP, 2017a. *Determination Regarding the Suitability of Dredged Material from the Squalicum Creek Waterway and Port of Bellingham Berthing Areas, Evaluated Under Section 404 of the Clean Water Act, for Unconfined Open-Water Disposal at the Rosario Strait Dispersive and Port Gardner Nondispersive Disposal Sites.* Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, May 3, 2017.

DMMP, 2017b. *Supplemental Determination Regarding the Suitability of Proposed Dredged Material from Bellingham Cold Storage, Evaluated Under Section 404 of the Clean Water Act for Unconfined Open-Water Disposal at the Rosario Strait Dispersive Site.* Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, November 9, 2017.

Herrera, 2017. *Squalicum Creek Waterway Federal Navigation Channel Dredged Material Characterization, Bellingham, Washington – Data Report*. Prepared by Herrera and NewFields for the U.S. Army Corps of Engineers, Seattle District, April 2017.

WSP, 2019. *Request for Permit Modification, Bellingham Cold Storage, Berth Maintenance Dredging (NWS-2015-737).* Memorandum prepared and submitted by WSP to USACE on behalf of Bellingham Cold Storage. May 7, 2019 (revised June 10, 2019).

9. Agency Signatures.

The signed copy is on file in the Dredged Material Managment Office.

Concur:

_____	_____
Date	David Fox, P.E. - Seattle District Corps of Engineers
_____	_____
Date	Justine Barton - Environmental Protection Agency
_____	_____
Date	Laura Inouye, Ph.D. - Washington Department of Ecology
_____	_____
Date	Abby Barnes - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Randel Perry – Seattle District Regulatory
Penny Kelley – Ecology
Gary White – Bellingham Cold Storage
Grace Roberts – WSP

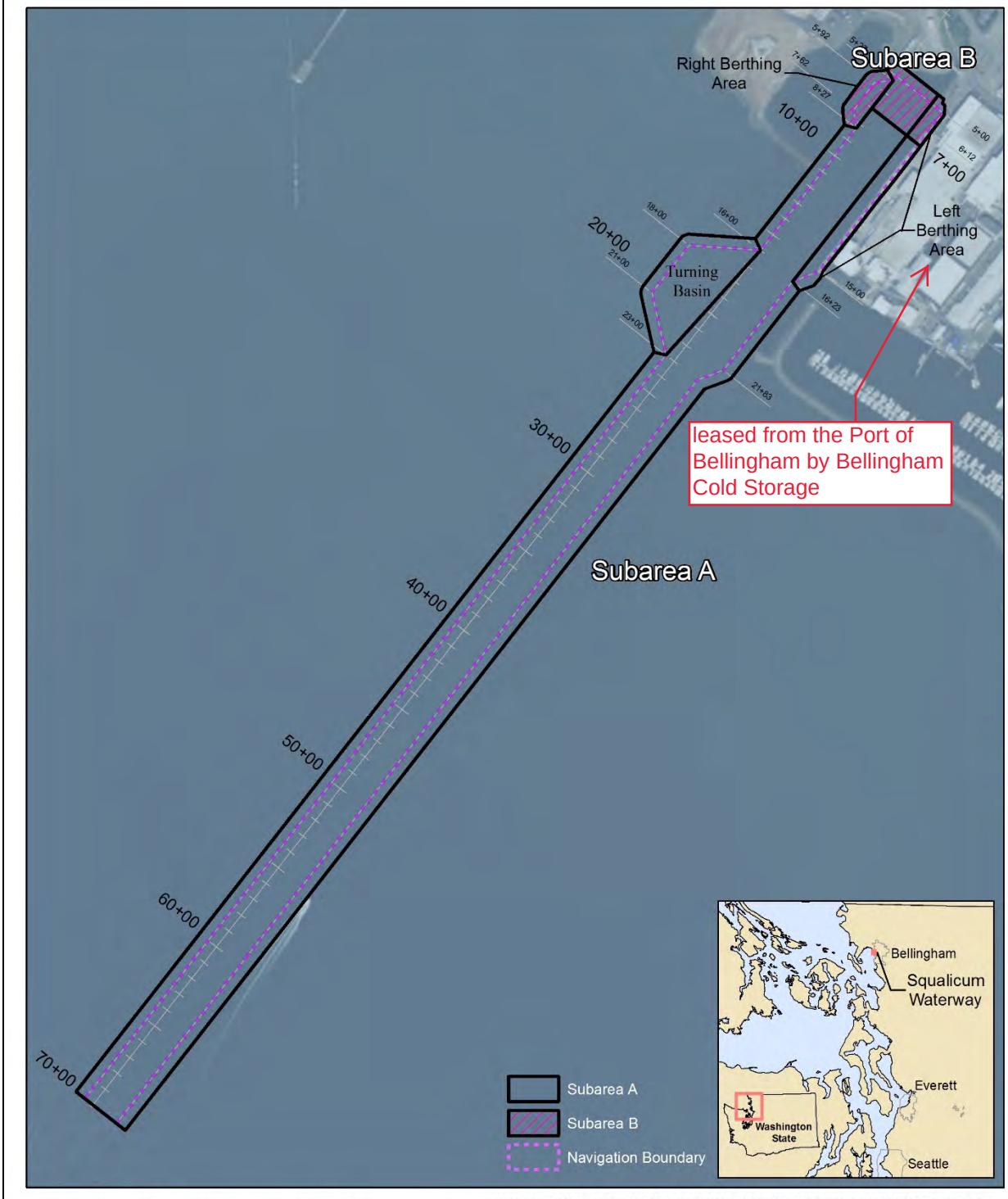

Figure 1. Squalicum Creek Waterway Study Area (NewFields 2017)

Figure 2

	Easting	Northing	Elevation
Area 1	1,236,030.66	646,568.73	-11
	1,235,958.84	646,476.95	-11
	1,236,117.12	646,353.07	-11
	1,236,141.77	646,384.57	-11
	1,236,118.15	646,403.06	-11
	1,236,165.32	646,463.33	-11
Area 2 Transition	1,235,922.81	646,430.92	-28
	1,235,958.84	646,476.95	-11
	1,236,117.12	646,353.07	-11
	1,236,081.09	646,307.03	-28

N=646430.920
E=1235922.810
EL=-28.000
PROVIDED
BY USACE

STA "A" 7+03.50

N=646307.030
E=1236081.090
EL=-28.000
PROVIDED
BY USACE

STA "A" 7+02.82

EXISTING BATHYMETRY (2019)

ASSUMED USACE
NAVIGATION DREDGING
CONFIGURATION

DREDGED MATERIAL
MANAGEMENT VERTICAL (DMMU)
BOUNDARY (USACE 11/2017)
TYP

toe of slope was set back 5 ft from the channel line to prevent the side slope from intersecting unsuitable material in DMMU AMB1

these side and transition slopes are from the USACE dredge plan

this darker gray line is the footprint of the BCS dredge plan (assuming that the federal dredging is completed prior to the BCS dredging)

SEE NOTE 1

NOTE

1. THE FINAL DESIGN OF THE TRANSITION AREAS BETWEEN THE USACE CHANNEL DREDGING AND THE BCS BERTH DREDGING WILL BE REFINED WHEN THE USACE CHANNEL DREDGING DESIGN IS COMPLETED. THE ACTUAL BOUNDARY AND VOLUME OF DREDGING MAY VARY.

CORPS
CONTROL
POINT LINE

D X-4
C X-3
B X-3
F X-5
E X-5
A X-2

-25 -20 -15 -10 -5 -30

CL CHANNEL

BERTH

65.00

60.00

EXISTING
TOE OF
SLOPE

toe of slope from dredging in 2018

PROPOSED
BCS TOE
OF SLOPE
EL=-30

the transition slope daylights at about Station 5+60

the transition slope intersects the unsuitable DMMU LBB (north), which is shown here in pink. The portion of LBB (north) to be dredged will be disposed upland.

8+00 7+00 6+00 5+00 4+00

A Line

BCS PIER

STA 6+22

STA 7+25

DATUM – ELEVATION
MLLW = 0.0

blue dashed line is the boundary of material to be disposed upland, including 5-ft horizontal buffer

southern boundary of DMMU LBB(N) is at STA 5+82

STA 5+87

1" = 20' scale 20 0 20 40 feet

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FAX: (206) 431-2250

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DESIGN BY RGP
CHECK BY SLF
PROJ MGR JRG

CLIENT

BELLINGHAM COLD STORAGE

PLAN

DRAWING NO. X-1
PROJECT NO. A19.0199
DATE: 4/30/19
SHEET NO. 1 OF 5

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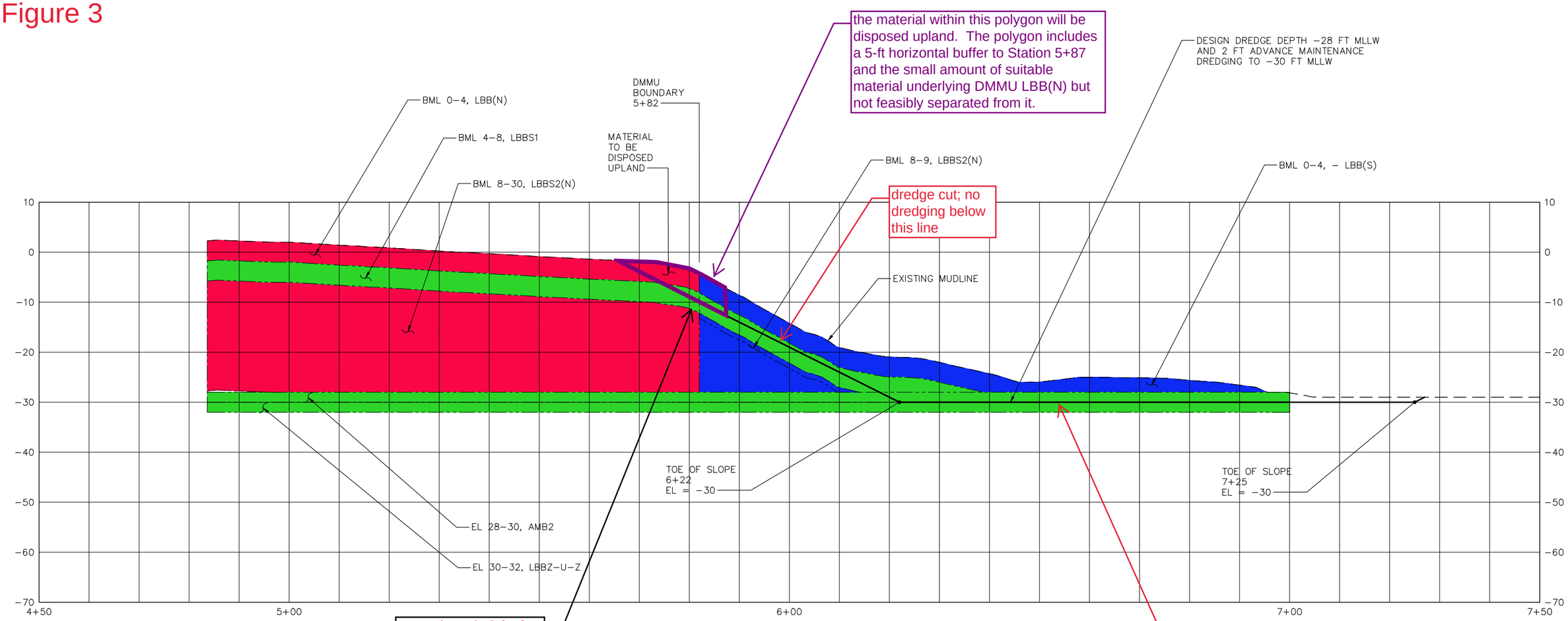
Figure 3



A / X-1 **BERTH LONGITUDINAL SECTION**
SCALE: NTS

LEGEND

- DIOXIN / FURAN TEQ > 10mg/kg *
- DIOXIN / FURAN TEQ < 4−10mg/kg
- DIOXIN / FURAN TEQ < 4mg/kg

BML = BELOW MUDLINE
DMMU THICKNESS (FEET) = 0−4
LBBxx = DMMU IDENTIFICATION
DMMU = DREDGED MATERIAL MANAGMENT UNIT

* PER USACE SUITABILITY DETERMINATION NOVEMBER 2017

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SECTION 1

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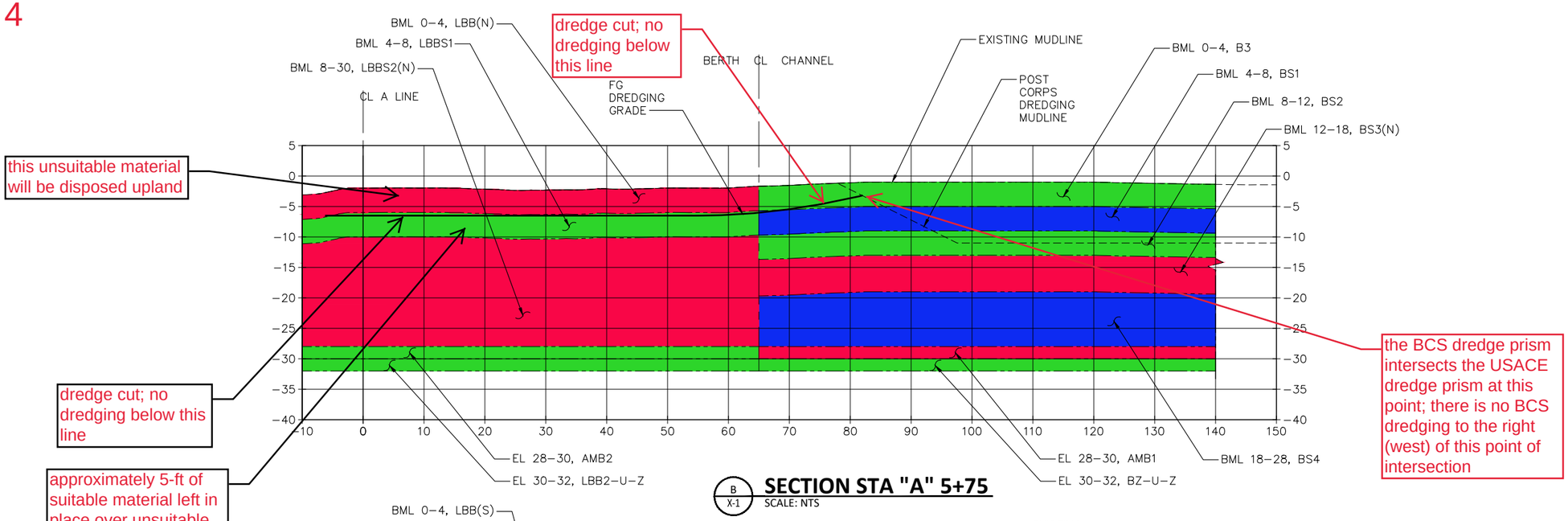
Figure 4



NOTE:

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SECTION 2

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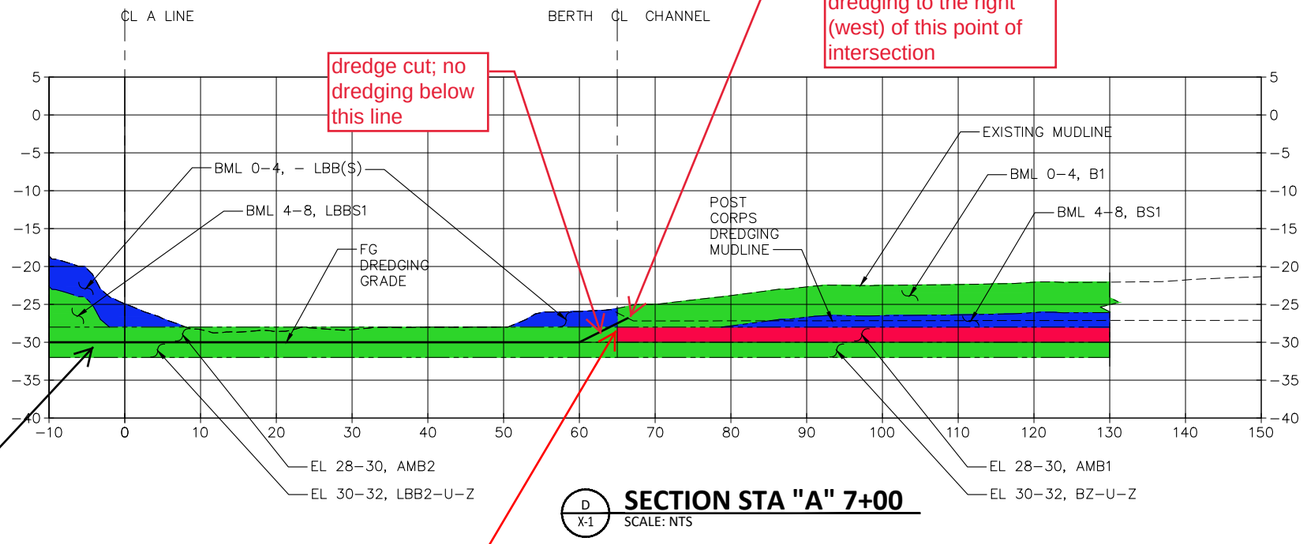
Figure 5



D X-1 **SECTION STA "A" 7+00**
SCALE: NTS

dredge cut; no dredging below this line

the BCS dredge prism intersects the USACE dredge prism at this point; there is no BCS dredging to the right (west) of this point of intersection

dredge cut; no dredging below this line

6 inches of suitable material left in place above unsuitable DMMU AMB1 where the side slope passes above it; see text for details

NOTE:

SEE SHEET X–2 FOR LEGEND.

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SECTION 3

DRAWING NO. **X-4**
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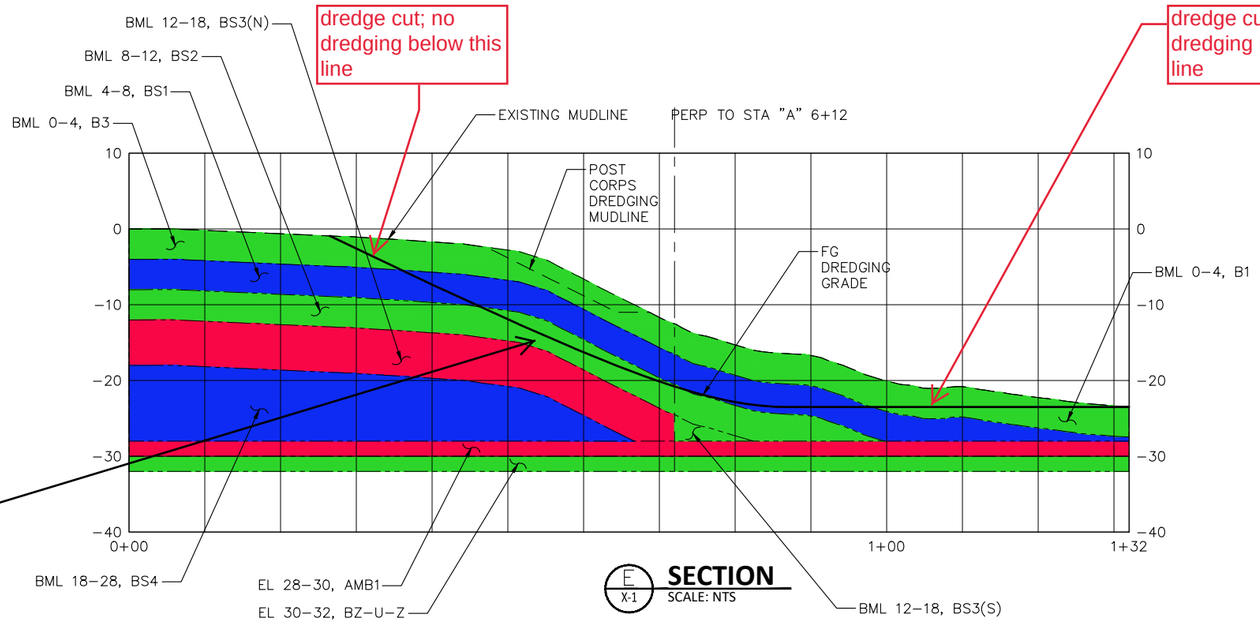
Figure 6

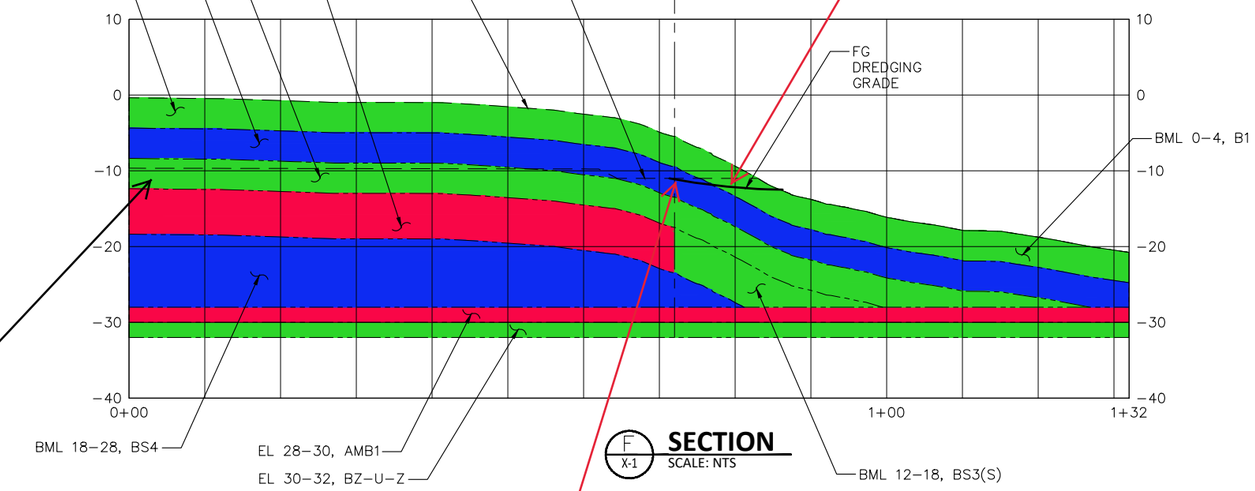


dredge cut; no dredging below this line

dredge cut; no dredging below this line

approximately 2-3 ft of suitable material left in place over unsuitable DMMU BS3(N)

E X-1 **SECTION**
SCALE: NTS



dredge cut; no dredging below this line

approximately 2-3 ft of suitable material left in place over unsuitable DMMU BS3(N) following dredging by USACE

the BCS dredge prism intersects the USACE dredge prism at this point; there is no BCS dredging to the left (north) of this point of intersection

F X-1 **SECTION**
SCALE: NTS

NOTE:

SEE SHEET X-2 FOR LEGEND.

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SECTION 4

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Table 2. Dredging Specifications

Old Stationing	New Stationing	Design Depth (ft MLLW)	Overdepth (ft)	Advanced Maintenance (ft)	Total Depth (ft MLLW)	Side Slope	Dredge Width (ft)	Offset from federal channel line (ft)	Disposal Site	Comments
6+22 to 7+25	33+78 to 32+75	-26	2	2	-30	1V:2H	60	5	Port Gardner	5-ft offset from channel line avoids incursion into unsuitable DMMU AMB1
5+87 to 6+22	34+13 to 33+78	1V:2H transition slope from -30 to -12.5 ft MLLW				1V:2H	60	5	Port Gardner	5-ft offset from channel line avoids incursion into unsuitable DMMU AMB1
5+60 to 5+87	34+40 to 34+13	Continuation of transition slope from -12.5 ft MLLW to daylight; daylights at a depth of approximately -1 ft MLLW				1V:2H	70	Not applicable	Upland	This area includes a 5-ft horizontal buffer on the south and west sides to ensure that no unsuitable material is placed at the Port Gardner site

Table 3. VWA dioxin concentration (ng/kg TEQ) for BCS berth dredging (with federal channel dredged first)

DMMU ID	Old Stationing	New Stationing	Depth	Volume (cy)	Volume (cy) Including 25% Contingency	Dioxin TEQ (ng/kg)	Volume x Dioxin TEQ
Berth							
LBB(S)	5+82 to 7+00	34+18 to 33+00	0 to 4 feet BML	1,287	1,609	6.00	9,654
LBBS1	5+00 to 7+00	35+00 to 33+00	4 to 8 feet BML	901	1,126	3.23	3,637
LBBS2(S)	5+82 to 7+00	34+18 to 33+00	8 to 9 feet BML	101	126	4.61	581
AMB2	5+00 to 7+00	35+00 to 33+00	-28 to -30 feet MLLW	663	829	0.66	547
Channel							
B1	6+12 to 7+00	33+88 to 33+00	0 to 4 feet BML	131	164	2.69	441
B3	5+00 to 6+12	35+00 to 33+88	0 to 4 feet BML	82	103	2.64	272
BS1	5+00 to 7+00	35+00 to 33+00	4 to 8 feet BML	156	195	5.29	1,032
BS2	5+00 to 7+00	35+00 to 33+00	8 to 12 feet BML	49	61	0.54	33
Total					4,213		16,197
						Volume Weighted Average TEQ (ng/kg) (16,197 ÷ 4,213) =	3.8

note 1: an additional 169 cy from DMMU LBB(N) will be dredged and disposed upland; LBB(N) is known as LBB (north) in DMMP (2017a).

note 2: the stationing is for the boundaries of the DMMUs, not the dredge prism.

note 3: LBB(S) and LBBS2(S) are known respectively as LBB (south) and LBBS2 (south) in DMMP (2017a).

Table 4. VWA dioxin concentration (ng/kg TEQ) for BCS berth dredging (with BCS dredged first)

DMMU ID	Old Stationing	New Stationing	Depth	Volume (cy)	Volume (cy) Including 25% Contingency	Dioxin TEQ (ng/kg)	Volume x Dioxin TEQ
Berth							
LBB South	5+82 to 7+00	34+18 to 33+00	0 to 4 feet BML	1,287	1,609	6.00	9,654
LBB S1	5+00 to 7+00	35+00 to 33+00	4 to 8 feet BML	901	1,126	3.23	3,637
LBBS2 South	5+82 to 7+00	34+18 to 33+00	8 to 9 feet BML	101	126	4.61	581
AMB2	5+00 to 7+00	35+00 to 33+00	-28 to -30 feet MLLW	663	829	0.66	547
Channel							
B1	6+12 to 7+00	33+88 to 33+00	0 to 4 feet BML	156	195	2.69	525
B3	5+00 to 6+12	35+00 to 33+88	0 to 4 feet BML	220	275	2.64	726
BS1	5+00 to 7+00	35+00 to 33+00	4 to 8 feet BML	197	246	5.29	1,301
BS2	5+00 to 7+00	35+00 to 33+00	8 to 12 feet BML	49	61	0.54	33
Total					4,467		17,004
						Volume Weighted Average TEQ (ng/kg) (17,004 ÷ 4,467) =	3.8

note 1: an additional 169 cy from DMMU LBB(N) will be dredged and disposed upland; LBB(N) is known as LBB (north) in DMMP (2017a).

note 2: the stationing is for the boundaries of the DMMUs, not the dredge prism.

note 3: LBB(S) and LBBS2(S) are known respectively as LBB (south) and LBBS2 (south) in DMMP (2017a).

Attachment 1

Errors were found in several dioxin concentrations after this document had been signed. Please see corrections on page 6 and in Figures 9 and 10.

Note: with the exception of Figures 9 and 10, the original figures, tables and attachment associated with Attachment 1 have been removed from this document, but are available on the DMMO website.

CENWS-ODS-ND

MEMORANDUM FOR RECORD May 3, 2017

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF DREDGED MATERIAL FROM THE SQUALICUM CREEK WATERWAY AND PORT OF BELLINGHAM BERTHING AREAS, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR UNCONFINED OPEN-WATER DISPOSAL AT THE ROSARIO STRAIT DISPERSIVE AND PORT GARDNER NONDISPERSIVE SITES.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of 418,551 cubic yards (cy) of dredged material from the Squalicum Creek Waterway federal navigation channel and Port of Bellingham berthing areas for disposal at the Rosario Strait dispersive and Port Gardner nondispersive open-water disposal sites.

2. Background. As authorized by Congress in the Rivers and Harbors Acts of 1925 and 1930, the U.S. Army Corps of Engineers (USACE) Seattle District conducts maintenance dredging of the Squalicum Creek Waterway Federal Navigation Project in Bellingham, Washington (Figure 1). USACE is also authorized to conduct sediment characterization, but not dredging, in the Port of Bellingham's berthing areas adjacent to the federal channel. The authorized depth of the channel and berthing areas is -26 feet (ft) mean lower low water (MLLW).

   Sedimentation in Squalicum Creek Waterway is due to input from the Nooksack River and Squalicum Creek. Sediment in the waterway has been characterized by USACE under the Puget Sound Dredged Disposal Analysis (PSDDA) program or DMMP four times, including three full characterizations and a reconnaissance survey for dioxins. Bellingham Cold Storage, a tenant of the Port of Bellingham, has conducted sediment sampling in the waterway on two additional occasions. Table 1 provides a summary of the characterization and survey results. A complete description can be found in Attachment A.

   A bathymetric survey of the Squalicum Creek Waterway and berthing areas conducted by USACE in March 2016 showed that significant sedimentation had occurred. USACE contracted with Herrera Environmental and subcontractor NewFields to characterize the waterway and left berthing area to -30 ft MLLW (authorized depth of -26 ft plus 2 ft of advanced maintenance and 2 ft of overdepth). Characterization of the right berthing area, which is currently not in use, was restricted to -22 ft MLLW (-20 ft plus 2 ft of overdepth).

3. Project Summary. Table 2 includes project summary and tracking information.

Table 2. Project Summary and Tracking Information

Project ranking	Subarea A: low-moderate (LM) Subarea B: high (H)
Characterized volume	418,551 cubic yards
Characterized depth	channel and left berthing area: -30 ft MLLW (including advanced maintenance and overdepth) right berthing area: -22 ft MLLW (including overdepth)
Draft SAP received	October 21, 2016
Draft SAP returned for revisions	November 9, 2016
Revised SAP received	November 18, 2016
Revised SAP approved	November 23, 2016
Sampling dates	sonic drilling: November 30 to December 2, 2016 vibracoring: November 29 to December 2, 2016 and December 30, 2016
Draft data report received	March 17, 2017
Comments provided on draft report	April 6, 2017
Final data report received	April 14, 2017
DMMO tracking number	SQUAL-A-378-16
EIM Study ID	SQUAL16
Recency Determination	Subarea A: December 2022 (LM rank = 6 years) Subarea B: December 2019 (H rank = 3 years)

4. Project Ranking and Sampling Requirements. The project was divided into 2 subareas for characterization. Subarea A included the navigation channel and left berthing area waterward of station 7+00. Subarea B included the navigation channel and left berthing area between stations 5+00 and 7+00, and the entire right berthing area. The DMMP agencies reviewed data from the two previous characterizations of Subarea A, including the left berthing area. The only exceedance of the 2016 screening levels (SLs) was for benzyl alcohol in the left berthing area in 2015. This exceedance was attributed to natural sources and bioassays were not required. Based on the data review, Subarea A was ranked a "low-moderate" concern for potential contamination. Sediment in Subarea B had previously been found unsuitable for open-water disposal. Therefore, the DMMP agencies retained the rank of "high" listed in the DMMP User Manual (DMMP, 2016) for the head of the waterway. All material in both subareas is considered heterogeneous in nature due to the length of time between dredging events.

   In the Dredged Material Management Program, "surface" material (i.e. the top 4 feet) is treated differently from "subsurface" material (deeper than 4 feet) for the purpose of calculating the number of field samples and dredged material management units (DMMUs) needed. The following guidelines applied to this project:

Subarea A (low-moderate ranked):

- Maximum volume of sediment represented by each field sample = 8,000 cy
- Maximum volume of sediment represented by each surface DMMU = 32,000 cy
- Maximum volume of sediment represented by each subsurface DMMU = 48,000 cy

Subarea B (high ranked):

- Maximum volume of sediment represented by each field sample = 4,000 cy
- Maximum volume of sediment represented by each surface DMMU = 4,000 cy
- Maximum volume of sediment represented by each subsurface DMMU = 12,000 cy

The volume of sediment requiring characterization was calculated using the March 2016 bathymetric survey data. It was not known at the time the sampling and analysis plan was developed when dredging might occur, so contingency factors were applied to the calculated volumes in the two subareas to cover additional sedimentation likely to occur over the time span covered by the recency period. The following contingency factors were calculated by USACE based on hydrosurveys conducted in 2009, 2010, 2013, 2015 and 2016:

Subarea A:

- main channel, turning basin and left berthing area (to -28 ft MLLW): 40%
- advanced maintenance in the main channel (-28 to -30 ft MLLW): 25%
- advanced maintenance in the turning basin (-28 to -30 ft MLLW): 0%
- advanced maintenance in the left berthing area (-28 to -30 ft MLLW): 15%

Subarea B:

- main channel and left berthing area (to -28 ft MLLW): 25%
- right berthing area (to -22 ft MLLW): 25%
- advanced maintenance in the main channel and left berthing area (-28 to -30 ft MLLW): 0%

Figures 2 and 3 are plan views of Subareas A and B, with insets showing cross-sections and schematics of the DMMU profiles. Figures 4-6 include the anticipated core profiles and compositing schemes. Tables 3 and 4 show the contingency factors and volume estimates for DMMUs in Subareas A and B respectively.

The volumes for all but one DMMU were within the DMMP volume limitations. DMMU AMA1, which represented the advanced maintenance material (-28 to -30 ft MLLW) underlying DMMUs A1 and A2 was allowed to slightly exceed the 48,000 cy limit for subsurface DMMUs in low-moderate ranked areas in order to maintain the same spatial coverage as DMMUs A1 and A2 combined.

Due to past findings of contamination in deeper sediment in Subarea B, subsurface DMMUs in this subarea were kept well below the limitation of 12,000 cy. In addition, DMMUs in the right and left berthing area were delineated separately from DMMUs in the main channel, so that independent determinations could be made for federal vs. non-federal dredged material.

Also, due to ambiguous results for past testing of dioxin in z-samples from Squalicum Creek Waterway (DMMP, 2012) and in order to potentially provide more precise vertical characterization of dioxin contamination if necessary to address antidegradation, USACE elected to collect z-samples in two one-foot increments at each station. Composites of the upper one-foot z-samples were slated to be analyzed for dioxin concurrently with testing of the DMMUs.

5. Sampling. Standard vibracoring was sufficient to collect samples from Subarea A, but gravel and cobble were anticipated in Subarea B, with cores up to 32 feet long needed to collect z-samples. Therefore, sonic drilling was required in that subarea.

   Field sampling was scheduled to be completed in a single week, however strong wind and waves were encountered prior to completion of the vibracoring. The sonic drilling in Subarea B was completed during the period November 30-December 2. Vibracoring began on November 29 but was suspended on December 2 due to safety concerns. Inclement weather throughout much of December prevented the sampling crew from returning until December 30. The remaining vibracore samples were collected that day.

   Other than the weather delay, vibracoring proceeded as described in the SAP, with one exception. DMMU AMA2 was to include a 2-ft core section (-28 to -30 ft MLLW) from all coring stations in DMMUs A3, A4 and A5. However, at the time of suspension of vibracoring due to weather, only 10 of the 12 cores from these three DMMUs had been collected. The two missing cores were from DMMU A3. Rather than risk exceeding holding times for AMA2, the DMMP agencies authorized analysis of AMA2 without contributions from the missing cores. Since A3 was farther away from likely sources of historical contamination than the other two DMMUs (A4 and A5) that made up AMA2, it was assumed that any sampling bias introduced by the missing cores would result in higher chemical concentrations in AMA2 rather than lower, so the decision to proceed with the processing of AMA2 was considered environmentally conservative by the DMMP agencies.

   For the sonic drilling, recovery rates in some sediment intervals – especially in the top 8 feet – were below the 75% target for recovery due to the presence of unconsolidated sand and gravel, which was difficult to retain in the cores. With vibracoring, low recovery can be an issue when long cores are being collected because it cannot be determined with certainty where the material that *is* recovered came from with regard to depth. The use of sonic drilling in Subarea B resolved this issue because the cores were advanced and collected in intervals that matched the upper and lower elevations of the DMMUs being sampled. Therefore, while recovery may have been less than the target fraction, it was known with certainty that the material being collected was representative of the DMMU being sampled. The DMMP agencies authorized the drillers to relax the acceptance criterion for recovery as long as sufficient material could be collected to conduct all the planned analyses.

   Two other issues were encountered during sonic drilling at station B3-2. A 20-ft length of drill casing was lost during drilling and could not be recovered. That casing remains buried within the sediment at B3-2. Also at this station, a hydrocarbon sheen and odor were encountered in the core section recovered from 27 to 32 ft below mudline. The mudline elevation at B3-2 was

-2.4 ft MLLW. Therefore, the elevation of the core section with the hydrocarbon sheen and odor was -29.4 to -34.4 ft MLLW. This core section was archived separately for possible later analysis.

Figures 7 and 8 show both the target and actual sampling stations in Subareas A and B respectively. There was good concurrence between the target coordinates and actual coordinates in Subarea A, with the exception of station A4-4. The sampling team discovered that the mudline elevation was -25.1 ft MLLW at the target coordinates for A4-4, which was significantly deeper than the mudline elevation of -20.9 ft MLLW anticipated in the SAP. This station was moved to shallower water, approximately 25 ft to the east of the target station, where the mudline elevation was -22.3 ft MLLW In Subarea B, concurrence between target and actual sampling stations was also good, with actual coordinates within 10 ft of the target coordinates in all cases. Tables 5 and 6 include sampling information for Subareas A and B respectively. Tables 7-11 include the core compositing schemes for all DMMUs.

One deviation from the SAP occurred during processing of core sections from station LBB-2, affecting three DMMUs:

- The core section from Core LBB-2 included in the composite representing DMMU LBBS1 was taken from 3.1 to 6.7 feet below mudline (-23.3 to -27.8 ft. MLLW); it should have been taken from 3.1 to 6.2 feet below mudline (-23.3 to -27.3 ft. MLLW).
- The core section from Core LBB-2 included in the composite representing DMMU LBBS2 was taken from 6.7 feet to 7.2 ft. below mudline (-27.8 to -28.5 ft. MLLW); it should have been taken from 6.2 to 6.7 feet below mudline (-27.3 to -28.0 ft. MLLW).
- The core section from Core LBB-2 included in the composite representing DMMU AMB2 was taken from 7.2 feet to 8.2 ft. below mudline (-28.5 to -30.0 ft. MLLW); whereas it should have been sampled from 6.7 to 8.2 feet below mudline (-28.0 to -30.0 ft. MLLW).

Following review of the chemical testing data – including dioxin – the DMMP agencies determined that this minor sample processing error at station LBB-2 had no effect on decision-making.

6. Chemical Analysis. Tables 12 and 13 present the sediment conventional and standard DMMP chemistry results for DMMUs and upper z-samples in Subareas A and B respectively. There were no detected SL exceedances in Subarea A and the detection limits for non-detects were all below SL as well. In Subarea B, two DMMUs had detected SL exceedances for at least one analyte. DMMU RB1-C exceeded the SL for 4-methylphenol. DMMU AMB1-C exceeded the SL for four individual PAHs, as well as Total LPAH. There were no bioaccumulation trigger (BT) exceedances for the standard DMMP chemicals of concern.

   Dioxin was analyzed in all DMMUs and in the upper composited z-samples. Tables 14 and 15 include the dioxin data for Subareas A and B respectively. Figure 9 shows the dioxin data for Subarea B. The dioxin concentrations for all DMMUs and z-samples in Subarea A were below the DMMP disposal site management objective of 4 nanograms per kilogram (ng/kg) toxic

equivalents (TEQ), with non-detected congeners set equal to one-half the estimated detection limit (EDL). In Subarea B, nine of the sixteen DMMUs exceeded 4 ng/kg TEQ. Of these, five DMMUs also exceeded the BT of 10 ng/kg. Three composited z-samples were tested for dioxin. The z-samples from the left berthing area and the main channel were both below 4 ng/kg TEQ, while the z-sample from the right berthing area had the highest concentration of all samples tested (19.3 ng/kg TEQ).

USACE evaluated the depth and spatial distribution of the chemical testing results within the context of planning an effective dredging project. Three decisions emerged from that evaluation:

a. It had already been determined that the Port of Bellingham's main tenant on the Squalicum Creek Waterway, Bellingham Cold Storage, no longer uses the right berthing area. Therefore, USACE determined that it was highly unlikely the right berthing area would be dredged within the recency period, thereby obviating the need to run bioassays to address the 4-methylphenol SL exceedance in DMMU RB1-C.
b. Given the SL exceedances for PAHs in the advanced maintenance material within the federal channel in Subarea B (DMMU AMB1-C), USACE decided that advanced maintenance dredging in that area would not be conducted. Under that scenario, bioassays on DMMU AMB1-C were not needed.
c. Finally, given the pattern of dioxin concentrations, it was suspected that dioxin contamination was likely higher toward the head of the waterway and lower in areas farther removed from the head. If this could be ascertained, USACE would be able to dredge more material from the outer portion of Subarea B, which would be beneficial for navigation. USACE hypothesized that the elevated concentration of dioxin found in DMMU BS3-C was likely due more to contributions from sediment collected from stations B2-1, B2-2, B3-1 and B3-2, rather than station B1-1. To test this hypothesis, USACE elected to analyze the individual core section from B1-1 that had been included in the composite for DMMU BS3-C (i.e. the sediment collected from 12 to 18 feet below mudline at B3-1). Similarly, in order to maximize the dredging that Bellingham Cold Storage could do in the left berthing area, USACE elected to analyze the individual core intervals from station LBB-2 that had been included in the composites for DMMUs LBB-C and LBBS2-C (0 to 4 ft below mudline and 8 to 9 feet below mudline respectively).

Results from the dioxin analysis of individual core sections can be found in Table 16. The hypothesis that cores farther removed from the head of the waterway would have lower dioxin concentrations was supported by the data. Whereas DMMU BS3-C – represented by composited material from five sampling stations – had a dioxin concentration of 11.8 ng/kg TEQ, the individual core section from station B1-1 had a dioxin concentration of only 2.44 ng/kg TEQ. Similarly, composited DMMUs LBB-C and LBBS2-C had dioxin concentrations of 13.0 and 13.4 ng/kg TEQ respectively, while corresponding individual core sections from station LBB-2 had dioxin concentrations of 7.34 and 5.33 ng/kg TEQ respectively.

This concentration was from a preliminary dataset in which non-detects were set equal to limits of detection. The concentration was 0.311 in the final dataset, in which non-detects were set equal to estimated detection limits in accordance with DMMP guidelines. See Table 16.

In response to the Essential Fish Habitat conservation recommendations that accompanied the National Marine Fisheries Service's biological opinion on the effects of dredged material disposal on listed rockfish species (DMMO, 2016), USACE agreed to conduct limited analysis

This was the preliminary concentration. The final concentration was 6.00

This was the preliminary concentration. The final concentration was 4.61

of polybrominated diphenyl ethers (PBDEs) for federal dredging projects in urban areas. For the Squalicum Creek Waterway O&M project, three DMMUs were analyzed for PBDEs. Results from this analysis are included in Table 17.

All chemistry data were validated by Herrera and EcoChem. EcoChem provided EPA Stage 4 validation for the dioxin and PBDE congener analyses. Herrera provided Stage 4 validation for the remaining organics and Stage 3 validation for metals and conventional parameters. Data qualifiers assigned by Herrera and EcoChem are found in the columns labeled "VQ" in Tables 12 to 17.

Only minor QA/QC issues were encountered with the chemical analysis. The initial metals analysis for DMMU A5-C resulted in a cadmium concentration of 6.9 mg/kg, which exceeded the SL of 5.1 mg/kg. But a laboratory duplicate run on that sample resulted in a cadmium concentration of only 0.20 J, which was well below SL and similar to the cadmium concentrations in other DMMUs. The lab reran DMMU A5-C in duplicate. Cadmium was undetected in both replicates at reporting limits that were well below SL (0.16 U and 0.17 U mg/kg). The result reported in Table 12 for cadmium in A5-C is from the first replicate of the reanalysis (i.e. 0.16 U mg/kg). Based on the totality of analytical results, the DMMP agencies determined that cadmium was not likely an issue in DMMU A5-C and bioassays were not required to be run on this sample.

A second minor QA/QC issue concerned chlordane. While undetected in all samples in the initial analysis, the lab was unable to achieve detection limits that were below the SL. This initial analysis was calibrated using a technical chlordane standard. The lab reanalyzed all samples using calibration standards for the individual chlordane components, which had lower detection limits than technical chlordane. The reanalysis resulted in either detected concentrations below the SL or non-detects with detection limits below SL.

7. Biological Testing. No bioassays or bioaccumulation testing were conducted.

8. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment from the federal navigation project and berthing areas in the Squalicum Creek Waterway for open-water disposal. The data gathered were determined to be sufficient and acceptable for regulatory decision-making under the DMMP program.

Subarea A

Based on the results of the previously described testing, the DMMP agencies concluded that all 336,199 cubic yards of sediment in Subarea A, including the advanced maintenance material, are suitable for open-water disposal at the Rosario Strait site. Material from Subarea A may also be taken to the Port Gardner site if needed to bring the volume-weighted average of Subarea B material going to that site below the 4 ng/kg TEQ site management objective.

Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 2013) or the State's antidegradation standard (DMMP, 2008). Comparison of the proposed dredged material to SQS serves as a first-tier indicator for this

purpose. The SQS for metals, phenols, benzoic acid and benzyl alcohol are the same as the SLs for these chemicals. Therefore, there were no SQS exceedances for these chemicals in Subarea A. The remaining SQS chemicals are normalized for organic carbon. The carbon-normalized results for these chemicals are included in Table 18. As can be seen from the table, there were no SQS exceedances. Also, as was discussed previously in this memorandum, the composited upper z-samples in Subarea A were analyzed for dioxin. The dioxin concentrations (Table 14) were all below 4 ng/kg TEQ, thereby meeting the antidegradation standard. In addition, the dioxin concentrations in the advanced maintenance material (-28 to -30 ft MLLW) in Subarea A were also below 4 ng/kg TEQ. If Subarea A is dredged without removing the advanced maintenance material, this material would become the newly exposed surface and meets the antidegradation standard.

In summary, the antidegradation standard will be met in Subarea A for standard DMMP COCs and dioxin, regardless of whether advanced maintenance is included in the dredge plan or not.

Subarea B

Until a specific dredging design is proposed, the DMMP agencies cannot definitively determine the suitability of material in Subarea B for disposal at the Rosario Strait or Port Gardner disposal sites. The extent of any future dredging by USACE in Squalicum Creek Waterway will depend on the level of funding received. Bellingham Cold Storage plans to dredge the left berthing area, but the design has not been finalized at this time. Therefore, for Subarea B, this suitability determination will present approximate volumes and discuss the requirements that must be met by any dredging in this subarea. If and when USACE has a defined project, it will be reviewed by the DMMP agencies for compliance with the requirements stipulated in this suitability determination and a supplemental suitability determination will be prepared and signed by the agencies. The same is true for any dredging by Bellingham Cold Storage.

Table 20 includes the approximate volumes in Subarea B that are suitable for disposal at the Rosario Strait and Port Gardner disposal sites, as well as volumes unsuitable for open-water disposal. Figure 10 provides this information graphically and also includes dioxin concentrations for reference. Several caveats are required when reviewing Table 20 and Figure 10:

a. The volumes shown suitable for disposal at the Rosario Strait site are based strictly on the chemical testing results, without regard to the dredgeability of these DMMUs. For example, DMMU LBBS1-C had no SL exceedances and had a dioxin concentration of 3.23 ng/kg TEQ. It is, therefore, ostensibly suitable for placement at the Rosario Strait site. However, it is sandwiched between layers with higher dioxin concentrations, which reduces the likelihood that LBBS1-C will be dredged as an independent unit for disposal in Rosario Strait.
b. The volumes shown suitable for disposal at the Port Gardner site are only suitable if the volume-weighted average dioxin concentration for all material taken to Port Gardner is below 4 ng/kg TEQ. For example, DMMU BS1-C had a dioxin concentration of 5.29 ng/kg TEQ, which exceeds the disposal site management objective of 4 ng/kg TEQ. Under the DMMP dioxin guidelines, it must be dredged and disposed with cleaner material such that the entire volume disposed has a

volume-weighted average under 4 ng/kg TEQ.

c. The volume splits for those DMMUs that had an individual core section analyzed for dioxin are to be considered rough estimates. These estimates were made for reporting purposes only and are subject to change. The supplemental suitability determination/s will include volumes calculated based on the actual dredge design.

Any dredging proposed for Subarea B must meet the following requirements:

a. The dioxin concentration of each individual DMMU taken to the Rosario Strait site must be at or below 4 ng/kg TEQ without volume-weighted averaging.
b. The volume-weighted average dioxin concentration for dredged material taken to the Port Gardner site must be at or below 4 ng/kg TEQ.
c. One-foot vertical buffers between suitable and unsuitable material and between material suitable for dispersive disposal and material suitable for nondispersive disposal must be incorporated in the dredging design at the discretion of the DMMP agencies.
d. Where possible, dredged material taken to the Port Gardner site must be sequenced, with material with the highest dioxin concentrations disposed first and dredged material with the lowest dioxin concentrations last.
e. The State of Washington's antidegradation standard must be met. This may mean leaving a one-foot vertical buffer of suitable material in place over sediment that does not meet the standard, or placing a one-foot clean sand cover following dredging.
f. Side slopes of the dredge design may not cut into unsuitable material or material that does not meet the antidegradation standard, unless the area of exposed surface is determined to be insignificant by the DMMP agencies.

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PSDDA, 1992a. *Memorandum for Record. Supplemental Determination on the Suitability of Dredged Material Tested under PSDDA Guidelines for Bellingham Maintenance Dredging in Squalicum Creek Waterway for Disposal at either the Bellingham Bay Nondispersive Open-Water Disposal Site or the Rosario Strait Dispersive Site*. Prepared by the Seattle District Dredged Material Management Office for the Puget Sound Dredged Disposal Analysis Program, February 1992.

PSDDA, 1992b. *Memorandum for Record. Supplemental Determination on the Suitability of the Surficial Dredged Material (i.e. Exceeding the Two Foot Allowable Guideline) Tested under PSDDA Guidelines for Bellingham Maintenance Dredging in Squalicum Creek Waterway for Disposal at either the Bellingham Bay Nondispersive Open-Water Disposal Site or the Rosario Strait Dispersive Site*. Prepared by the Seattle District Dredged Material Management Office for the Puget Sound Dredged Disposal Analysis Program, June 1992.

PSDDA, 1995. *Memorandum for Record. Determination on the Suitability of Dredged Material Tested under PSDDA Guidelines for Bellingham Harbor Maintenance Dredging at Squalicum Creek Waterway (CENPS-OP-NP-89/95-2-00323) for Placement at either the Bellingham Bay Nondispersive or the Rosario Strait Dispersive Open-Water Sites*. Prepared by the Seattle District Dredged Material Management Office for the Puget Sound Dredged Disposal Analysis Program, April 1995.

10. Agency Signatures.

The signed copy is on file in the Dredged Material Managment Office.

Concur:

_____ _____
Date David Fox, P.E. - Seattle District Corps of Engineers

_____ _____
Date Justine Barton - Environmental Protection Agency

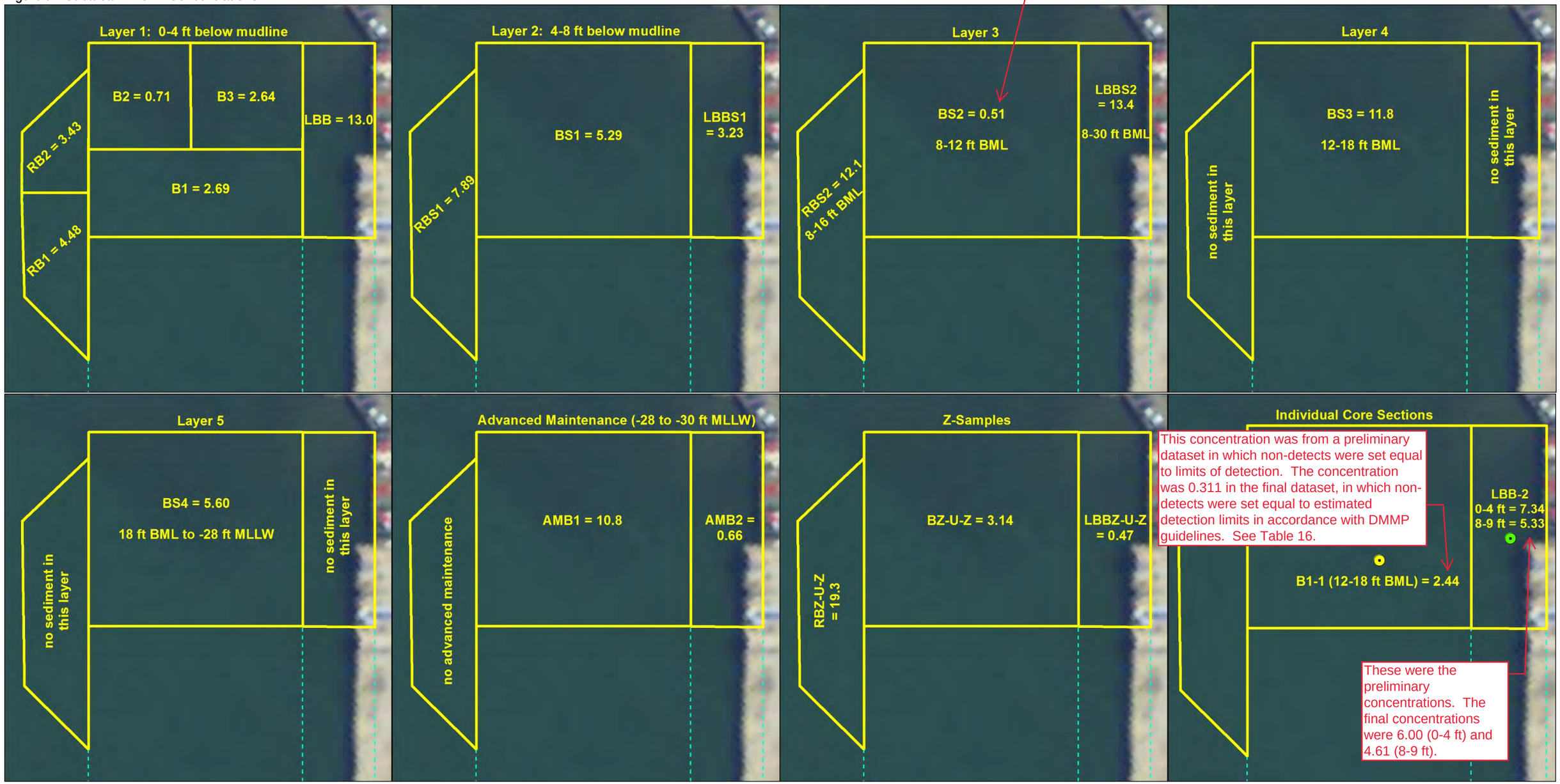
_____ _____
Date Laura Inouye, Ph.D. - Washington Department of Ecology

_____ _____
Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Kym Anderson, CENWS-ODS-NS
Elizabeth Chien, CENWS-ODS-NS
John Pell, CENWS-ODS-NS
Randel Perry, CENWS-ODR
Mike Hogan, Port of Bellingham
Gary White, Bellingham Cold Storage

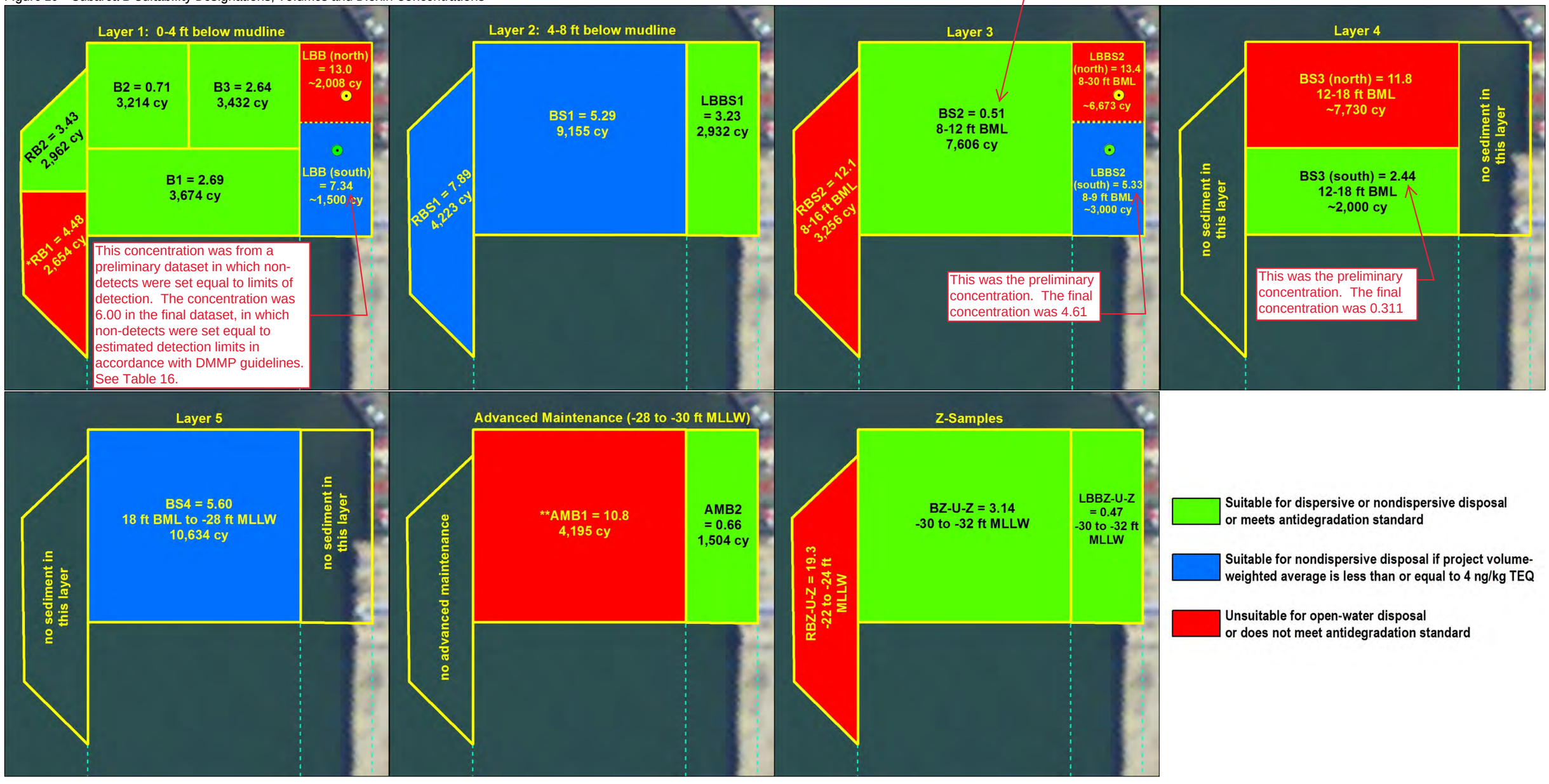
Figure 9 – Subarea B Dioxin Concentrations



Note: all dioxin concentrations in ng/kg toxic equivalents

BML = below mudline
MLLW = mean lower low water

Figure 10 – Subarea B Suitability Designations, Volumes and Dioxin Concentrations



Note: all dioxin concentrations in ng/kg toxic equivalents
BML = below mudline
MLLW = mean lower low water
TEQ – toxic equivalents

*DMMU RB1 exceeded the SL for 4-methylphenol but was not subjected to toxicity testing. It is therefore unsuitable for open-water disposal.
**In addition to the dioxin concentration exceeding 10 ng/kg TEQ, DMMU AMB1 exceeded the SL for several PAHs.

Attachment 2

Note: the original figures and attachments associated with Attachment 2 are not included in this document, but are available on the DMMO website.

CENWS-ODS-ND

MEMORANDUM FOR RECORD November 9, 2017

SUBJECT: SUPPLEMENTAL DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM BELLINGHAM COLD STORAGE, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR UNCONFINED OPEN-WATER DISPOSAL AT THE ROSARIO STRAIT DISPERSIVE SITE.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers [USACE], Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of 14,300 cubic yards (cy) of dredged material from Bellingham Cold Storage (BCS) for placement at the Rosario Strait dispersive open-water dredged material disposal site.

2. Background. BCS is located in Squalicum Creek Waterway, Bellingham (Figure 1). Sediment characterization of the entire waterway, including the BCS berthing area, was conducted by USACE in 2016-2017 (Herrera, 2017). A DMMP suitability determination based on the results of that characterization was signed by the DMMP agencies on May 3, 2017 (Attachment 1; DMMP, 2017). At the time of signing, neither USACE nor BCS had finalized their maintenance dredging plans. The suitability determination, therefore, described the data collected and evaluated the suitability of individual DMMUs for open-water disposal, but could not provide project-specific evaluations until dredging plans had been formulated. On October 4, 2017, BCS submitted their dredging plan (Attachment 2). This determination supplements the suitability determination made for Squalicum Creek Waterway on May 3, 2017 and provides a project-specific evaluation of the BCS dredging plan.

3. Project Description and Summary. BCS plans to dredge only that portion of the left berthing area that falls within Subarea A of the Squalicum Creek Waterway characterization (Figure 2). The slope at the northeast end of the dredge prism is designed to daylight at Station 7+00, which is the boundary between Subareas A and B. Similarly, the northern corner of the dredge prism is an arc with a radius of 25 feet, such that the top of slope avoids intersecting unsuitable material within the navigation channel in Subarea B. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Subarea A: low-moderate
Proposed dredging volume	14,300 cubic yards
Proposed dredging depth	-30 feet MLLW (including 2 feet of advanced maintenance and 2 feet of overdepth)
DMMO tracking number	SQUAL-A-378-16
EIM Study ID	SQUAL16
USACE Permit Application Number	NWS-2017-0301
Recency Determination (LM rank = 6 years)	December 2022

4. Summary of Dredged Material Characterization. Sampling of the BCS berthing area was conducted on November 29, 2016. Vibracores were collected from three sampling stations. Sediment from mudline to -28 ft MLLW from the three cores was composited (DMMU LBA) to represent the dredge prism without advanced maintenance (i.e. a design depth of -26 ft MLLW plus two feet of overdepth). Sediment from -28 to -30 ft MLLW from the three cores was composited (DMMU AMA3) to represent the additional two feet of material that would be dredged should advanced maintenance dredging be conducted.

   There were no DMMP SL exceedances in DMMUs LBA and AMA3. Dioxin concentrations were low, with toxicity equivalents (TEQs) of 3.98 and 2.68 ng/kg respectively for DMMUs LBA and AMA3. Details of chemical testing can be found in Attachment 1. No biological testing was needed.

5. Sediment Exposed by Dredging. Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (Ecology, 2013) or the State's antidegradation standard (DMMP, 2008). DMMP (2017) addressed this issue for the Bellingham Cold Storage dredging. The DMMP agencies determined that dredging in Subarea A, including the BCS berthing area, will meet the antidegradation standard regardless of whether advanced maintenance is conducted or not. The dioxin concentration of the Z-sample composite from the berthing area (LBAZ-U-Z) was 3.22 ng/kg TEQ.

6. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the BCS berthing area for open-water disposal. There were no SL exceedances in the DMMUs in the berthing area and dioxin concentrations were below the DMMP site management objective of 4 ng/kg TEQ. Based on the results of the previously described testing, the DMMP agencies conclude that all 14,300 cubic yards from the Bellingham Cold Storage berthing area are suitable for open-water disposal at the Rosario Strait dispersive site.

   This suitability determination does ***not*** constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

   A pre-dredge meeting with DNR, Ecology and the Corps of Engineers is required at least 7 days prior to dredging. A dredging and disposal quality control plan must be submitted to the Regulatory Branch of the Seattle District Corps of Engineers at least 7 days prior to the pre-dredge meeting. This plan must include: the equipment and vessels to be used, operational controls to ensure dredging accuracy, disposal positioning procedures, spill control and response measures, water quality monitoring, contingency plans in the event water quality standards are exceeded, debris management, personnel and responsibilities, dredging and disposal schedule, report submittals, agency contact information and coordination procedures. For this project, dredged material must be passed through a 1 ft x 1 ft grid prior to placement in the dump barge (DMMP, 2015). Debris is to be disposed at an upland location. The dredging and disposal quality control plan must be approved by the U.S. Army Corps of Engineers, Washington State Department of Natural Resources and the Washington State Department of Ecology prior to commencement of open-water disposal. A DNR site use authorization must also be acquired.

7. References.

DMMP, 2008. *Quality of Post-Dredge Sediment Surfaces (Updated).* A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

DMMP, 2015. *Debris Screening Requirements for Dredged Material Disposed at Open-Water Sites.* A DMMP Clarification Paper prepared by Erika Hoffman (EPA), Celia Barton (DNR) and David Fox (USACE) for the 2015 Sediment Management Annual Review Meeting, October 2, 2015.

DMMP, 2017. *Determination Regarding the Suitability of Dredged Material from the Squalicum Creek Waterway and Port of Bellingham Berthing Areas, Evaluated Under Section 404 of the Clean Water Act, for Unconfined Open-Water Disposal at the Rosario Strait Dispersive and Port Gardner Nondispersive Disposal Sites.* Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, May 3, 2017.

Ecology, 2013. *Sediment Management Standards – Chapter 173-204 WAC*. Washington State Department of Ecology, February 2013.

Herrera, 2017. *Squalicum Creek Waterway Federal Navigation Channel Dredged Material Characterization, Bellingham, Washington – Data Report*. Prepared by Herrera and NewFields for the U.S. Army Corps of Engineers, Seattle District, April 2017.

8. Agency Signatures.

The signed copy is on file in the Dredged Material Managment Office.

Concur:

_____ _____
Date David Fox, P.E. - Seattle District Corps of Engineers

_____ _____
Date Erika Hoffman - Environmental Protection Agency

_____ _____
Date Laura Inouye, Ph.D. - Washington Department of Ecology

_____ _____
Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Randel Perry – Seattle District Regulatory
Gary White – Bellingham Cold Storage
Sally Fisher - BergerABAM

Attachment 3

MEMO

TO: Randel Perry, U.S. Army Corps of Engineers

FROM: Grace Roberts, Environmental Scientist/Diver

SUBJECT: Request for Permit Modification
Bellingham Cold Storage, Berth Maintenance Dredging (NWS-2015-737)

DATE: 7 May 2019, revised 10 June 2019

ROUTE TO: Penny Kelly, Washington State Department of Ecology; Shandra O'Haleck, National Oceanic and Atmospheric Administration; Steve Sundin, City of Bellingham; and Steven Borrego, U.S. Fish and Wildlife Service

INTRODUCTION

The purpose of this memorandum is to request modification to Bellingham Cold Storage (BCS) Maintenance Dredging permits and associated federal, state, and local regulatory review and approvals. The proposed modification consists of adding dredging of the north end of the existing BCS berth located on the east side of the Squalicum Waterway in Bellingham Bay in Bellingham, Washington. This area was not included in the existing permits because dredging of materials unsuitable for open-water disposal was not considered feasible at the time those permits were developed.

This memorandum is intended to be used as an addendum to and in conjunction with previously received permits and permit application materials, including

JARPA (3 October 2017)
SEPA Checklist (October 2017)
Biological Evaluation (October 2017)
Dredged Material Management Program (DMMP) Suitability Determination (SD) (3 May 2017)
Shorelines Exemption (4 October 2017)
Hydraulic Project Approval (12 December 2017)
Certificate of Consistency with Coastal Zone Management Program (17 October 2017)

We assume these materials are already in agency files; please contact Grace Roberts, environmental scientist with WSP (grace.roberts@wsp.com) if you need any of these documents.

Attachments to this memorandum specifically addressing the proposed modifications include

JARPA figures, Sheets 1 to 13 dated September 2017 (BergerABAM 2017) revised May 2019

WSP USA
Suite 300
33301 Ninth Avenue South
Federal Way, WA 98003
Tel.: +1 206 431-2300

wsp.com

PROJECT BACKGROUND

PROJECT LOCATION, PURPOSE, AND NEED

The project site (Sheets 1-13) is located within the Squalicum Waterway on the north shore of Bellingham Bay as shown on JARPA Sheet 1. The BCS pier and berth are located along the east side of the waterway and are bounded on the west by the federal navigation channel.

Squalicum Creek enters the head of the waterway north of the BCS berth pier. Sediment deposited at the mouth of the creek has accumulated into a delta that extends into the northern portions of both the navigation channel and BCS berth. The face of the delta is a slope that rises from approximately Elevation -26 feet mean lower low water (MLLW) from Station 7+00 to approximately -3 feet MLLW at Station 5+82 (Sheet 3).

The northern portion of the channel and the berth has in-filled by ongoing deposits.

The BCS berth is defined by the U.S. Army Corps of Engineers (USACE) navigation channel boundaries and extends along the pier from Station 16+30 to Station 5+00 (Sheet 1). The north end of the BCS pier is located at approximately Station 6+22. The current functional end of the berth is at approximately 7+12. This means that the toe of the slope/north end of the functional berth is about 90 feet shorter than the pier. The shortened berth affects BCS's vessel berthing and unloading activities.

The current permits address dredging only to Station 7+00 due to the presence of dioxin-containing materials located within the sediment deposits north of Station 7+00.

The purpose of the proposed modification is to extend the permitted dredging area from Station 7+00 to Station 5+60. The need for this dredging is to restore functional length and improve the full operational limits of the berth. The only additional dredging being proposed is within the permit modification boundary shown on Sheets 1- 3.

The proposed dredging design can be viewed in detail on Sheets 3 and 9-12 and is described in detail below.

This proposed modification is to a ten-year maintenance dredging permit. As such, we are requesting that this modification be included in the ten-year maintenance dredge permit. This modification adds an additional 3,000 cubic yards (CY) dredged twice over the ten year period.

PROJECT DESCRIPTION

The berth and adjacent channel were characterized in 2017 with respect to Dredged Material Management Program (DMMP) criteria as described in the May 2017 DMMO Suitability Determination (SD). The characterization indicates that dioxins are present in interbedded layers in the existing sediment north of station 7+00 in both the channel and the BCS north berth.

Three suitability classifications of that material are documented in the 2017 SD.

Sediment with 4 or less nanograms/kilogram (ng/kg) dioxin TEQ is suitable for open-water disposal at the existing DMMP disposal sites at Rosario Strait or Port Gardner.
Sediment with 4 to 10 ng/kg dioxin TEQ can be disposed at Port Gardner if the volume weighted average (VWA) of all the material is less than 4 ng/kg.

Sediment with greater than 10 nanograms/kilogram (ng/kg) dioxin TEQ is not suitable for open-water disposal at either DMMP site and must be disposed upland.

The design of the proposed north berth dredging has been closely coordinated with the Dredged Material Management Office (DMMO) to (1) avoid dredging of material deemed unsuitable for in-water placement (material with dioxin concentrations greater than 10 ng/kg TEQ) other than that which will be disposed upland; and (2) coordinate the dredging configuration with upcoming dredging of the adjacent channel by the USACE and the Port of Bellingham. The dredging slope is also designed to daylight at approximately Elevation -1 foot MLLW to avoid impacts to intertidal habitat (Sheet 3).

this is a typographic error; the total volume (including 169 cy of unsuitable material) is 4,382 cy.

The total dredging volume for the berth and slope transition with the channel is ~~3,706~~ 4,212 cubic yards (CY). This volume includes ~~10~~ 25 percent contingency and assumes the USACE navigation channel maintenance dredging will be completed before the BCS berth dredging.

Sheets 9 to 12 show cross sections of the proposed dredge prism with respect to dioxin concentrations of the various depth layers in both the berth and the affected parts of the adjacent channel dredging as determined by the 2017 SD.

The cross sections show the following.

A layer with dioxin concentration greater than 10 ng/kg is located from 0 to 4 feet below mudline (BML) in the berth area. The volume of the zone is ~~137 CY~~ 169 CY (including 25 percent contingency); that material will be dredged and disposed at an upland landfill (Republic Services Roosevelt Regional Municipal Solid Waste Landfill in Roosevelt, Washington).

The remaining proposed dredged material has dioxin concentrations between 0 and 10 ng/kg and, when combined has a VWA of ~~4.4~~ 3.8[1] (see Table 1). The suitability of this material for disposal at the Port Gardner DMMP site in Everett, Washington, awaits a supplemental suitability determination from the DMMP agencies.

Dredging boundaries are configured to avoid cutting into remaining unsuitable materials in the subsurface layers of the berth and adjacent channel. The design includes vertical buffers of at least 6-inches between suitable and unsuitable materials. Horizontal buffers between suitable and unsuitable material will be at least 5 feet.

The north boundary of the dredging area has been placed to minimize impacts to intertidal habitat.

[1] A clerical error discovered in the data set after the issuance of this memo on 7 May 2019 found that VWA is 3.8 ng/kg.

Table 1. Final Permitting Volumes and Volume-Weighted Average of Suitable Material

	Depth	Volume (Cubic Yards)	~~10~~ 25% Volume Contingency (Cubic Yards)	Total Volume (Cubic Yards)	Dioxin TEQ (ng/kg)	Volume x Dioxin TEQ	Volume Weighted Average TEQ (ng/kg)
Berth - unsuitable							
LBB North	0-4 feet BML	135[2]	34	169	13	NA	NA
Volume-Weighted Averaging of Suitable Material							
Berth - suitable							
LBB South	0-4 feet BML	1,287	~~129~~ 322	1,609	6.00	9,654	
LBB S1	4-8 feet BML	901	~~90~~ 225	1,126	3.23	3,637	
LBBS2 South	8-9 feet BML	101	~~10~~ 25	126	4.61	581	
AMB2	-28-30 feet MLLW	663	~~66~~ 166	829	0.66	547	
Channel - suitable							
B1	0-4 feet BML	131	~~13~~ 33	164	2.69	441	
B3	0-4 feet BML	82	~~8~~ 21	103	2.64	272	
BS1	4-8 feet BML	156	~~15~~ 39	195	5.29	1,032	
BS2	8-12 feet BML	49	~~5~~ 12	61	0.54	33	
Total - suitable				~~3,706~~ 4,213		**16,197**	**~~4.4~~ 3.8[3]**

CONSTRUCTION METHODS

The dredging is expected to occur in September or October 2019 when the channel dredging is completed. Dredging best management practices (BMPs), water quality monitoring, and all other requirements of the existing permits will be followed. Additional BMPs will include

The proposed dredging will be completed using a small clamshell dredge to control accuracy of the cuts and avoid disturbing the zones of unsuitable material.

The surface layer of unsuitable material and 1 foot of underlying suitable material[4] will be dredged first and placed in a barge designed to allow dewatering at the site (i.e., flat barges with sides or a hay bale perimeter and turbidity-controlled drainage).

Dredging will be closely monitored and pre- and post-dredging surveying will be performed to document the materials and locations dredged.

Following dewatering, the unsuitable material will be transported in the barge to an appropriate off-loading facility in Bellingham Bay to be placed in containers for transport to the Republic Landfill in Roosevelt.

[2] This material to be disposed upland – not included in VWA

[3] A clerical error discovered in the data set after the issuance of this memo on 7 May 2018 found that VWA is 3.8 ng/kg.

[4] During the process of coordinating review of the draft supplemental suitability determination with the DMMP agencies, the Corps noticed the unfeasibility of separating suitable material underlying DMMU LBB North from the unsuitable material. The Corps will be requiring that all material dredged north of station 5+87 (includes a 5-ft horizontal buffer) be disposed upland. This requirement should have very little effect on the volume being disposed upland since it is a small quantity of suitable material being dredged below LBB North.

Appropriate BMPs will be used during transfer to avoid spilling of dredged material or excess drainage. The BMPs will include protective ground covering, specific transfer procedures, and site cleanup when completed. The specific transfer procedures will be described in the contractor's dredging and disposal plan and submitted to the USACE and other applicable regulatory agencies for review and approval prior to dredging.

The remaining suitable dredged material will be placed in a bottom dump barge for transport to the Port Gardner DMMP site in Everett.

REGULATORY INFORMATION

The existing permits, reviews, and regulatory approvals for dredging the BCS berth are listed below. This memorandum and attachments will be distributed to all the agencies listed with follow-up contact on behalf of BCS by the WSP design and permitting team.

Permit	Permit Contact	Issued	Expires
10-Year Dredge Permit	Randel Perry (360) 734-3156 Randel.j.perry@usace.army.mil	1/26/18	1/25/28
401 Water Quality Certification	Penny Kelly Pkel461@ecy.wa.gov	12/28/17	
CZM Concurrence		1/3/18	
CZM Form		10/17/17	
ESA Section 7 Concurrence	Shandra O'Haleck 360-753-9533 Shandra.ohaleck@noaa.gov		
HPA	Robert Warinner 360-466-4345 Ext. 252 Robert.warinner@dfw.wa.gov		2/15/22
SEPA DNS	Steve Sundin ssundin@cob.org	10/6/17	
Shoreline Exemption Notice of Decision	Steve Sundin ssundin@cob.org	10/31/17	
USFWS Concurrence	Steven Borrego 360-753-4410	12/15/17	

SUMMARY

WSP is requesting a permit modification on behalf of BCS. The proposed modification consists of adding dredging of the north end of the existing BCS berth as described above. Existing permits are on file with the agencies and can be requested at any time from Grace Roberts, WSP (grace.roberts@wsp.com).

Additional contacts include

Joe Galloway, Senior Project Engineer, WSP (joe.galloway@wsp.com)

Gary White, Vice President Engineering, Bellingham Cold Storage (gary.white@bellcold.com)

GHR/nb
7 May 2019, revised 10 June 2019

Attachments

JARPA Sheets 1 to 13 (BergerABAM September 2017 revised May 2019)

Q:\FederalWay\2019\A19.0199\00\GIS\02_MXD\JARPA\Fig1_Vicinity.mxd

REFERENCE #: NWS-2017-301

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

Sheet 1 of 13

Berth Maintenance Dredging

SHEET 1: VICINITY MAP

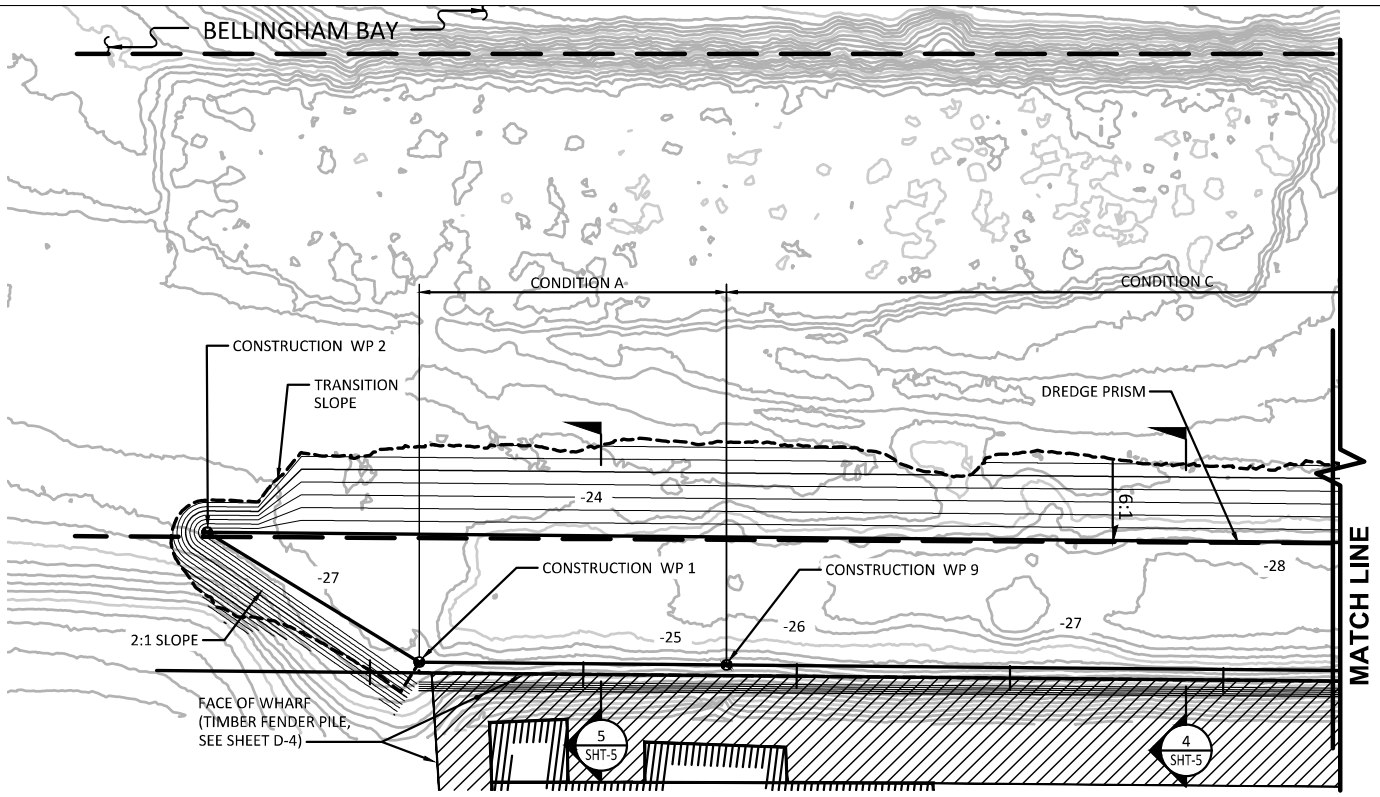
BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83

DATE: September 2017
Revised May 2019

N

0 250 500 Feet

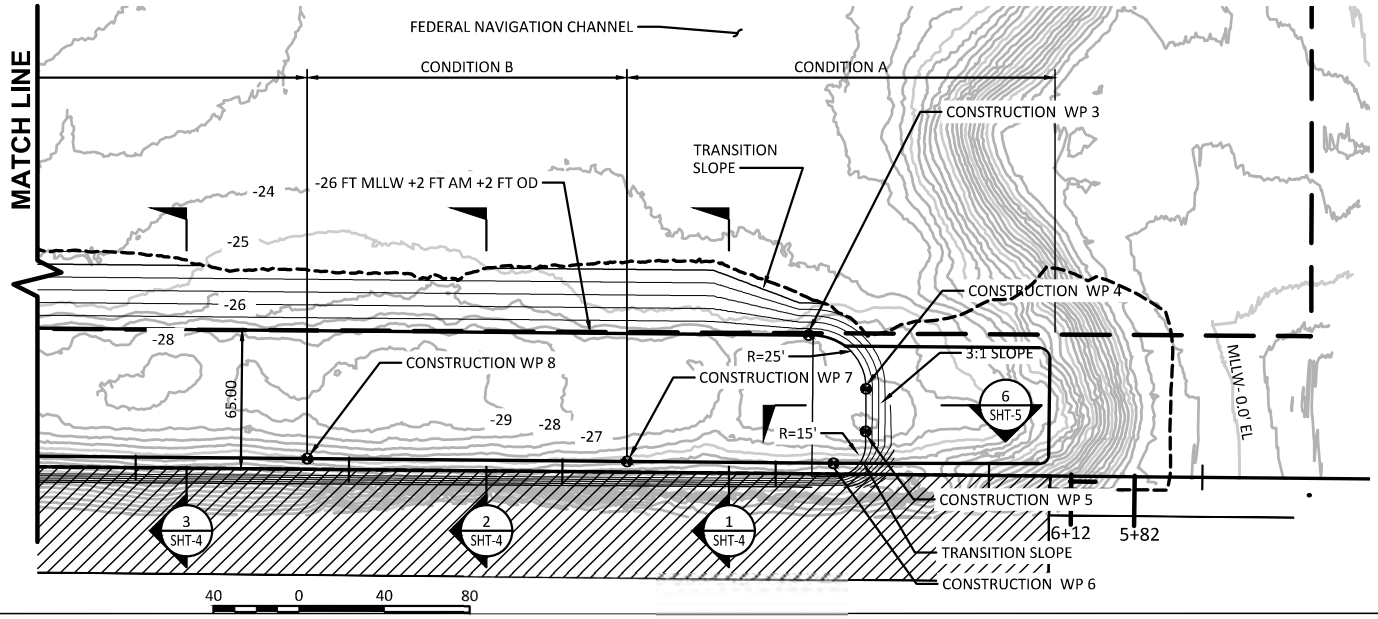


Notes:

1. Design Dredge Depth = -26 feet MLLW
2. Advanced Maintenance Dredging (AM) = 2 feet (-26 to -28 feet MLLW)
3. Overdredge Allowance (OD) = 2 feet Maximum (-28 to -30 feet MLLW)
4. Cross Sectional drawings on Sheets SHT-3 and SHT-4
5. Conditions A, B and C detail shown on sheets SHT-5, SHT-6, and SHT-7

LEGEND:

FEDERAL NAVIGATIONAL CHANNEL BOUNDARY
DREDGE PRISIM
DREDGE CONTOURS
EXISTING CONTOURS
CONSTRUCTION WORK POINT



REFERENCE #: NWS-2017-301

APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

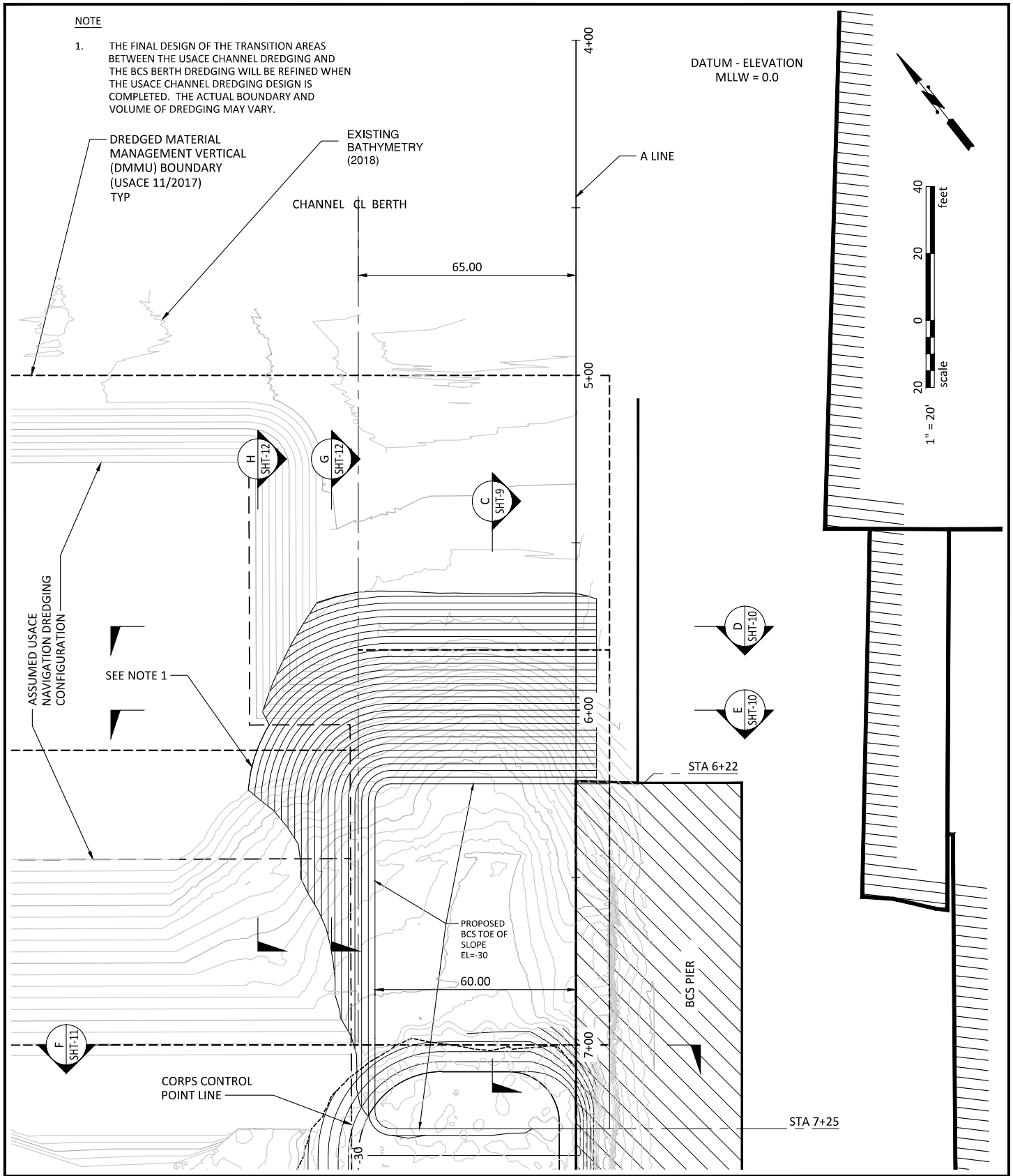
ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

Berth Maintenance Dredging

SHEET 2: PROJECT SITE

BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83
DATE: September 2017
Revised May 2019



REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 ROEDER AVE.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

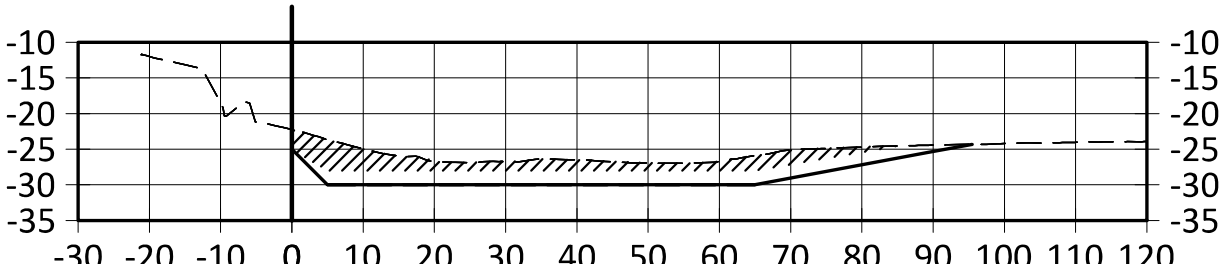
SHEET 3 of 13

Berth Maintenance Dredging

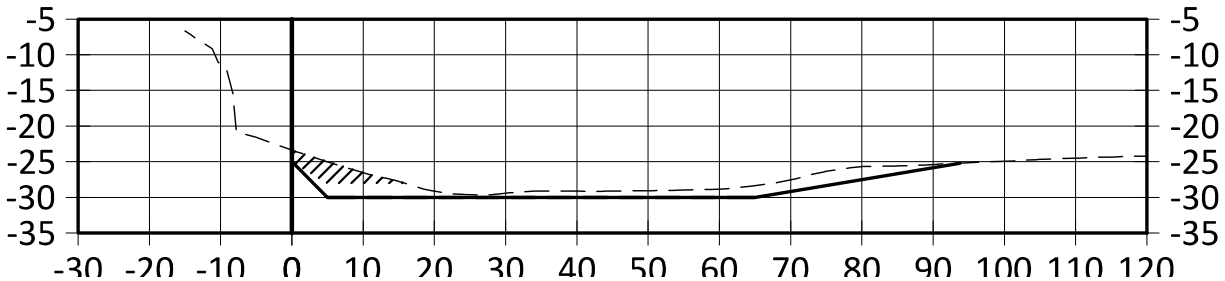
SHEET 3 : PROJECT SITE (NORTH END)

BCS
BELLINGHAM COLD STORAGE

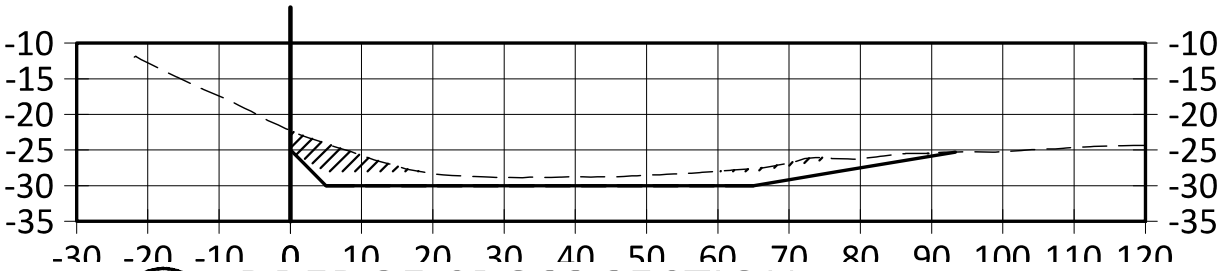
PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: BELLINGHAM
COUNTY: Whatcom
LAT: 48° 45' 32.33" N
LONG: 122° 30' 38.24" N
DATUM: NAD 83
DATE: September 2017
Revised May 2019



1 SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"



2 SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"



3 SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"

REFERENCE #: NWS-2017-301

APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham
Sheet 4 of 13

Berth Maintenance Dredging
SHEET 4: DREDGE SECTIONS

BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
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LAT: 48°45'32.33"N
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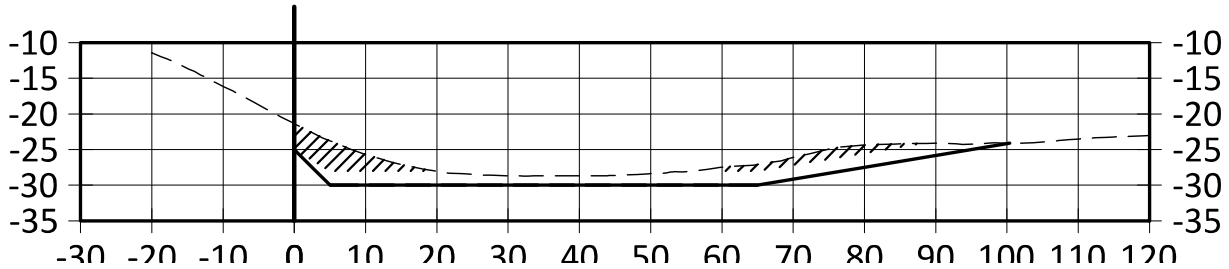
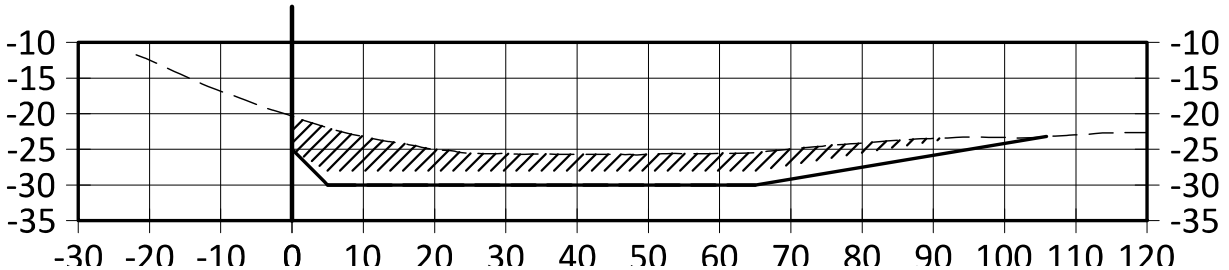
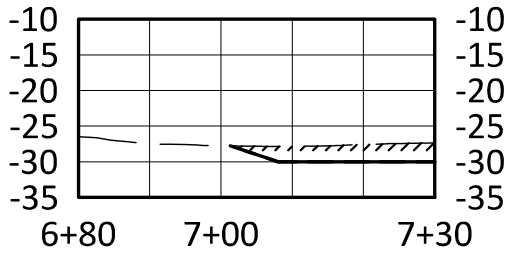
DATE: September 2017
Revised May 2019



3 / SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"



5 / SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"



6 / SHT-2 **DREDGE CROSS SECTION**
SCALE: 1" = 20'-0"

REFERENCE #: NWS-2017-301

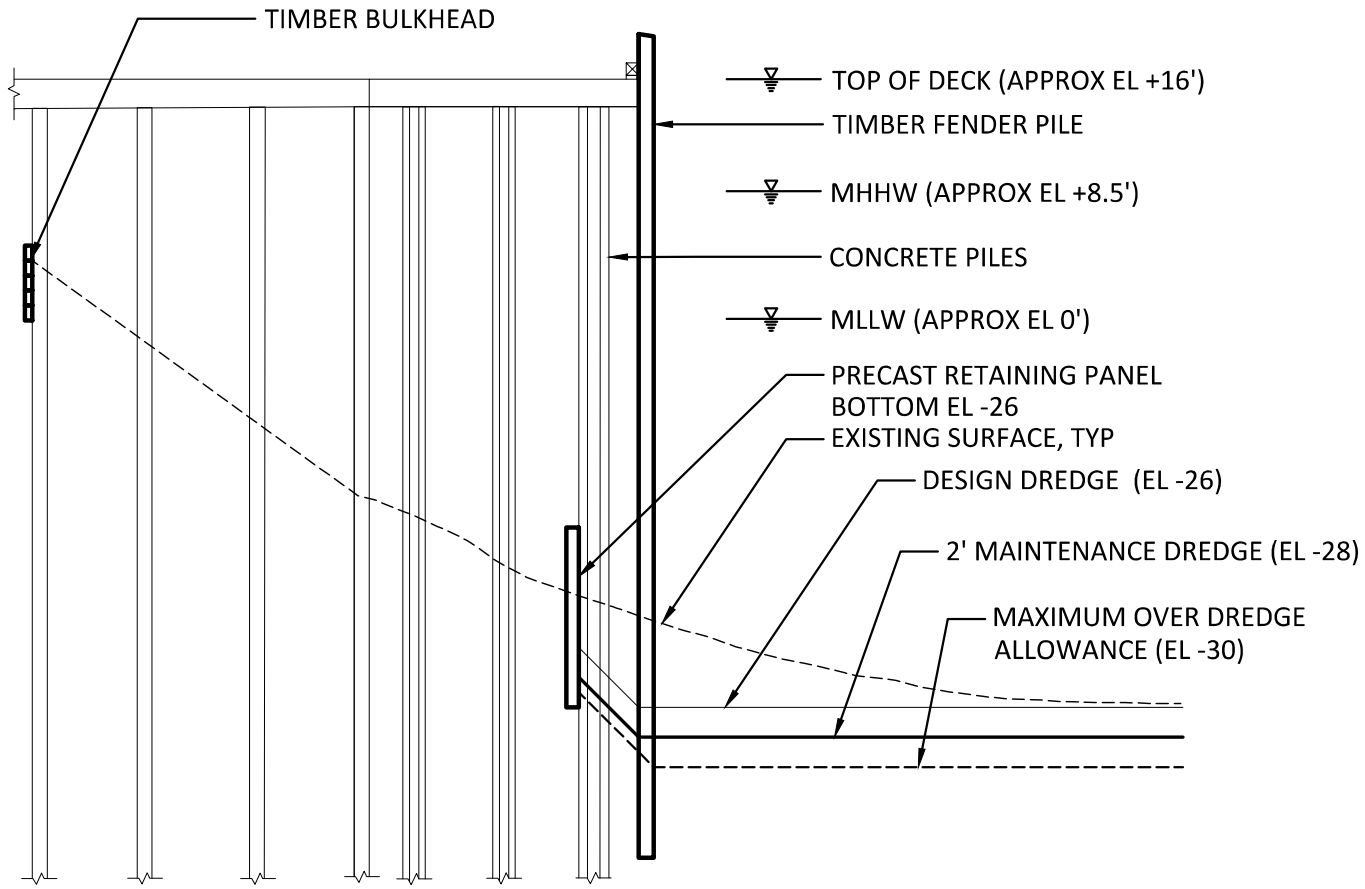
APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham
Sheet 5 of 13

Berth Maintenance Dredging
SHEET 5: DREDGE SECTIONS

BCS BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83
DATE: September 2017
Revised May 2019



SHT-2 **CONDITION A**

NOT TO SCALE

STA 6+18 TO STA 8+20
STA 13+80 TO STA 15+26

DATUM: MLLW=0.0

LEGEND:
EL= ELEVATION
TYP= TYPICAL

REFERENCE #: NWS-2017-301

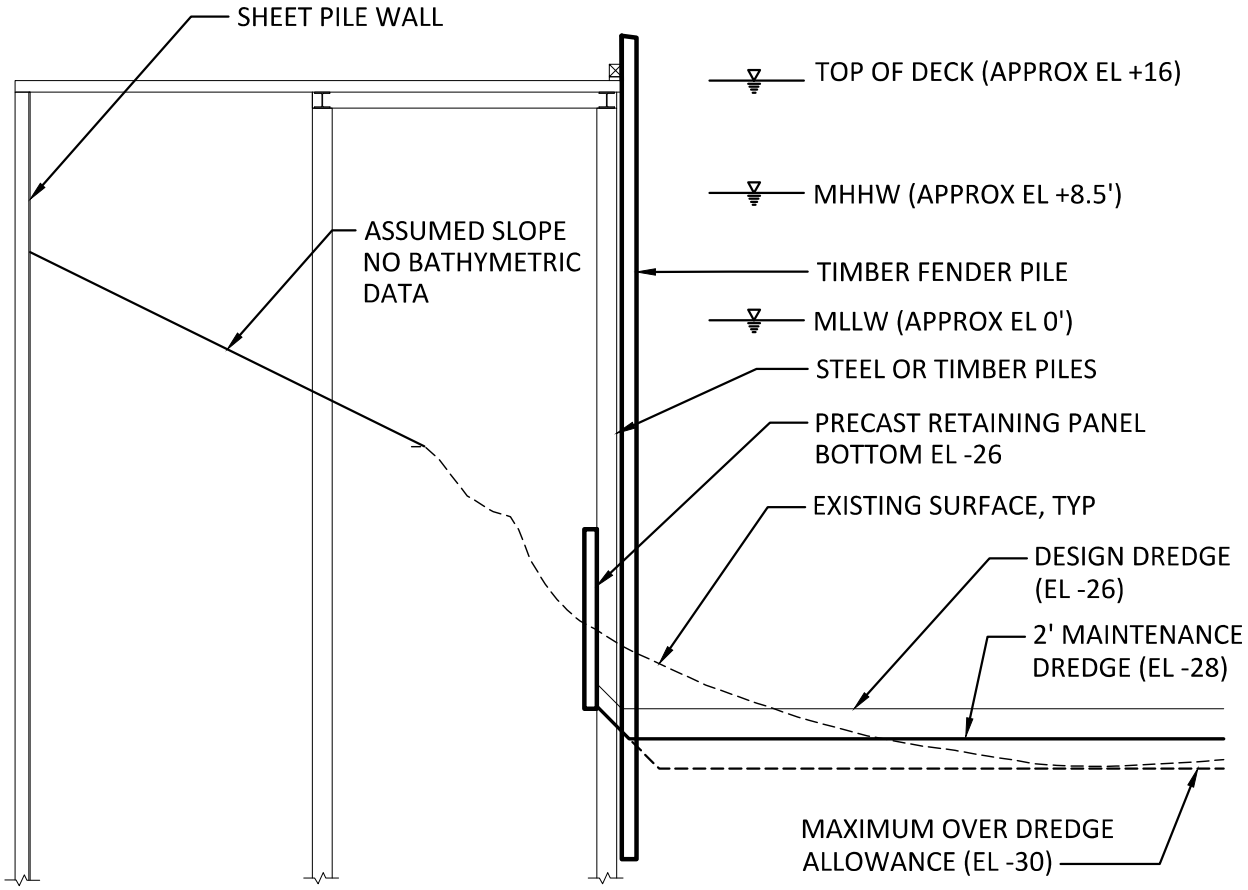
APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham
Sheet 6 of 13

Berth Maintenance Dredging
SHEET 6: DREDGE SECTIONS

BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83
DATE: September 2017
Revised May 2019



SHT-2 **CONDITION B**

NOT TO SCALE

STA 8+20 TO STA 9+64

DATUM: MLLW=0.0

LEGEND:
EL= ELEVATION
TYP= TYPICAL

REFERENCE #: NWS-2017-301

APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

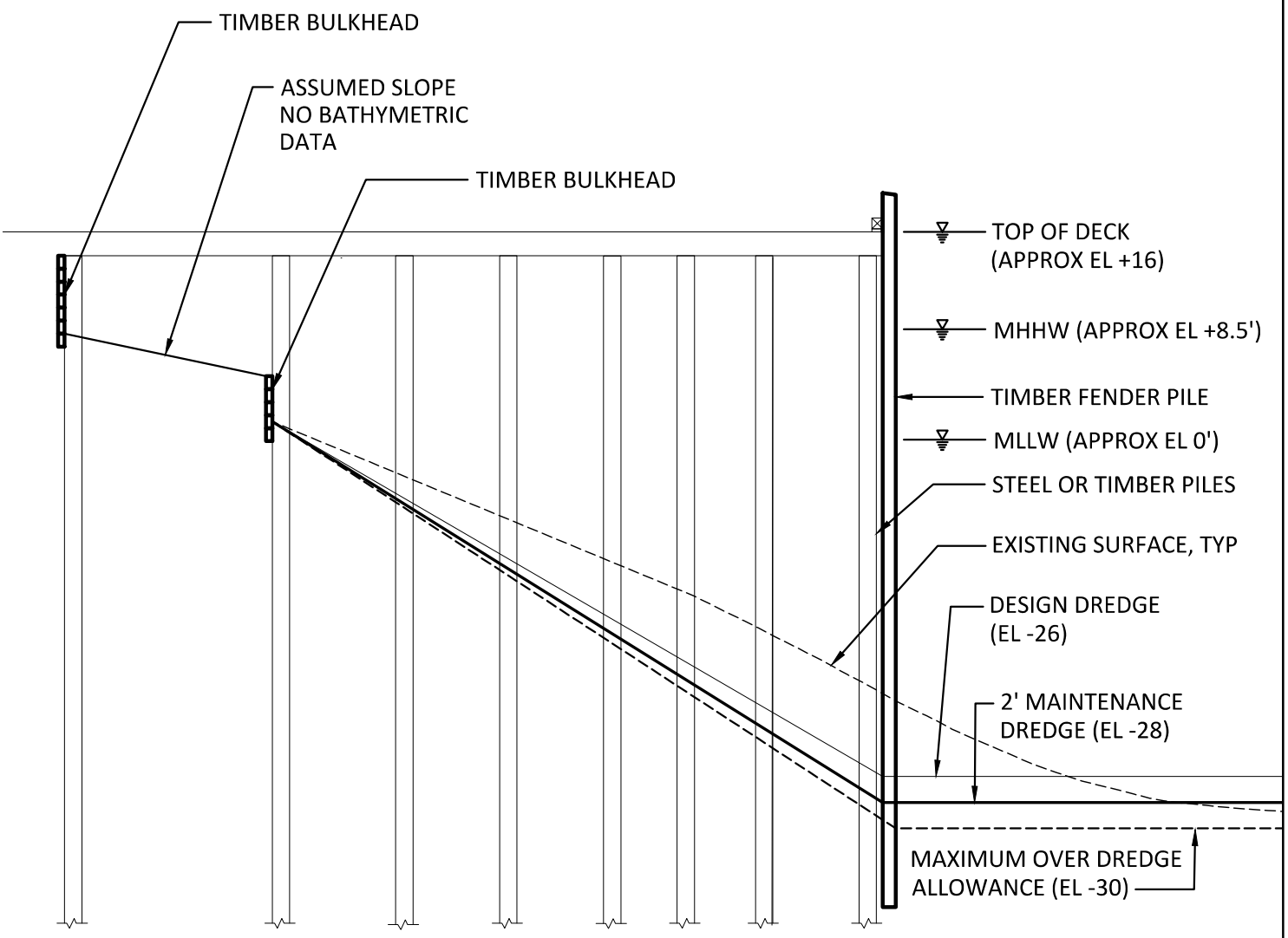
ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

Berth Maintenance Dredging

SHEET 7: DREDGE SECTIONS

BCS BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83
DATE: September 2017
Revised May 2019



SHT-2 **CONDITION C**

SCALE: 1"=10'

STA 9+64 TO STA 13+80

DATUM: MLLW=0.0

LEGEND:
EL= ELEVATION
TYP= TYPICAL

REFERENCE #: NWS-2017-301

APPLICANT: Bellingham Cold Storage
ADDRESS: Bellingham Cold Storage
2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

Berth Maintenance Dredging
SHEET 8: DREDGE SECTIONS

BCS BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodated Commercial Vessels
IN: Squalicum Waterway
AT: Bellingham
COUNTY: Whatcom
LAT: 48°45'32.33"N
LONG: 122°30'38.24"W
DATUM: NAD 83
DATE: September 2017
Revised May 2019

REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 ROEDER AVE.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

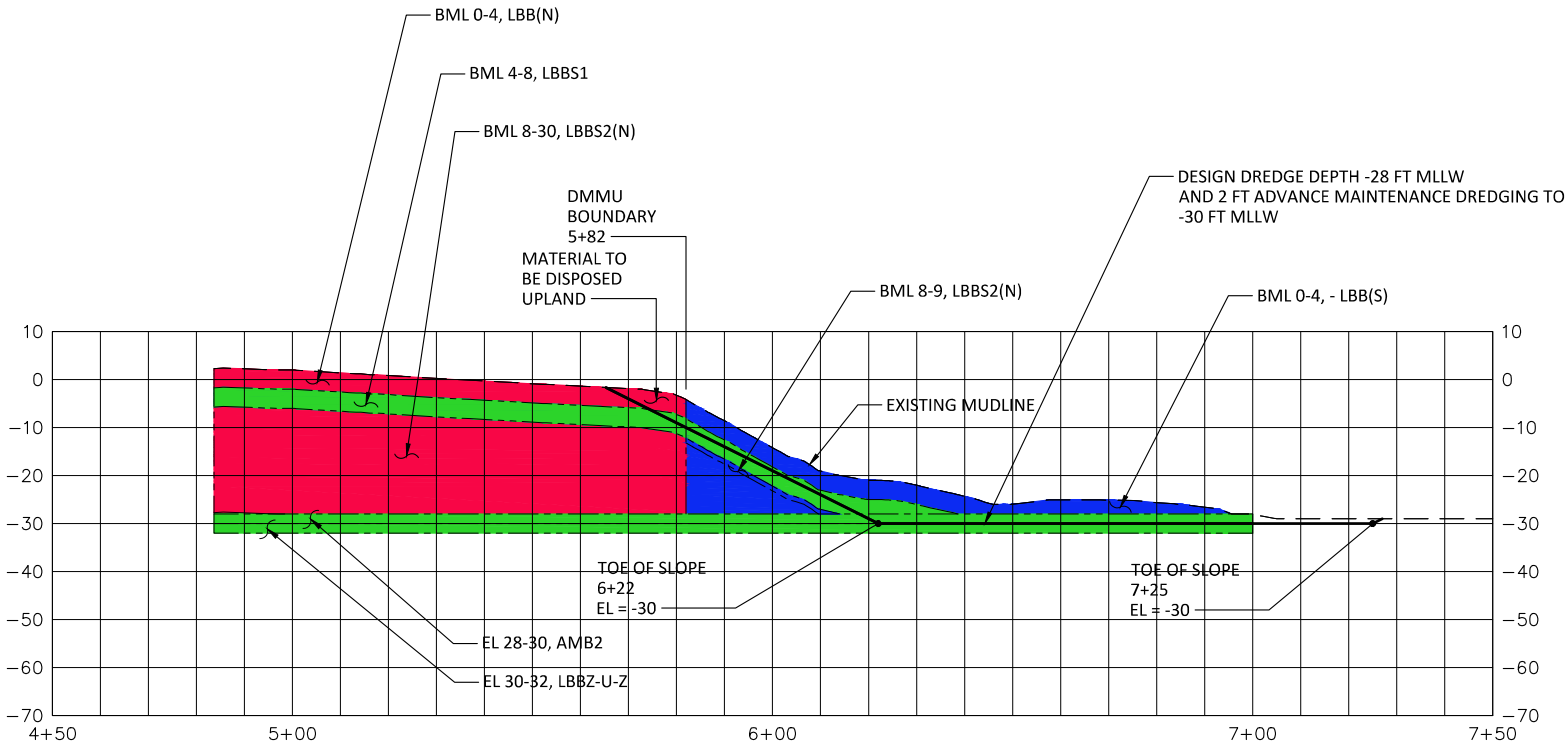
SHEET 9 of 13

BELLINGHAM COLD STORAGE

Berth Maintenance Dredging

SHEET 9 : NORTH BERTH DREDGE SECTION

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: BELLINGHAM
COUNTY: Whatcom
LAT: 48° 45' 32.33" N
LONG: 122° 30' 38.24" N
DATUM: NAD 83
DATE: September 2017
Revised May 2019



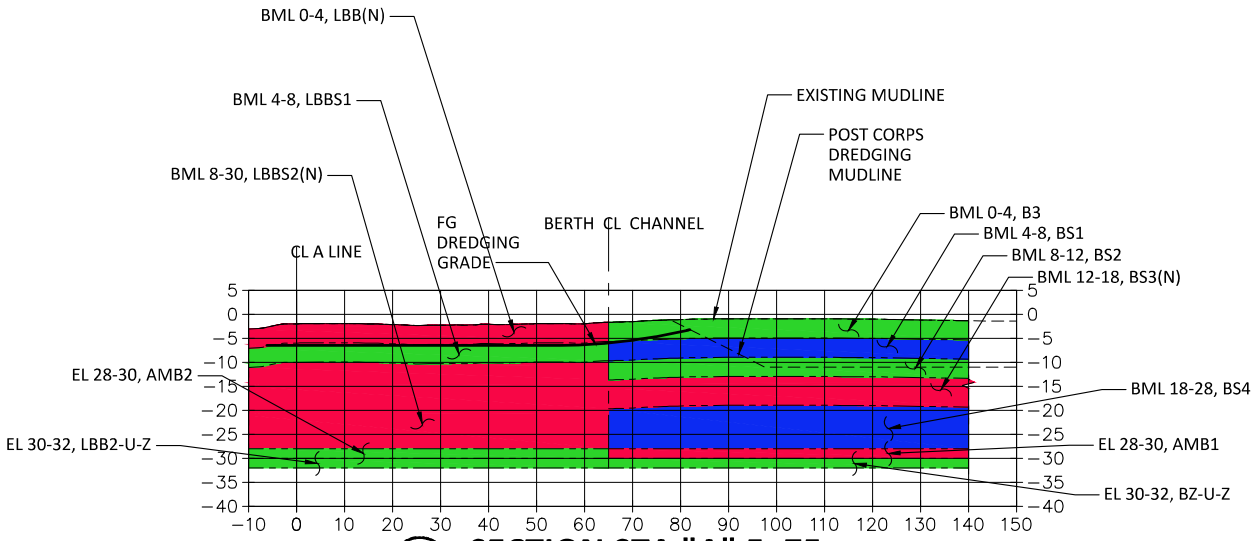
C SHT-3 **BERTH LONGITUDINAL SECTION**
SCALE: NTS

LEGEND

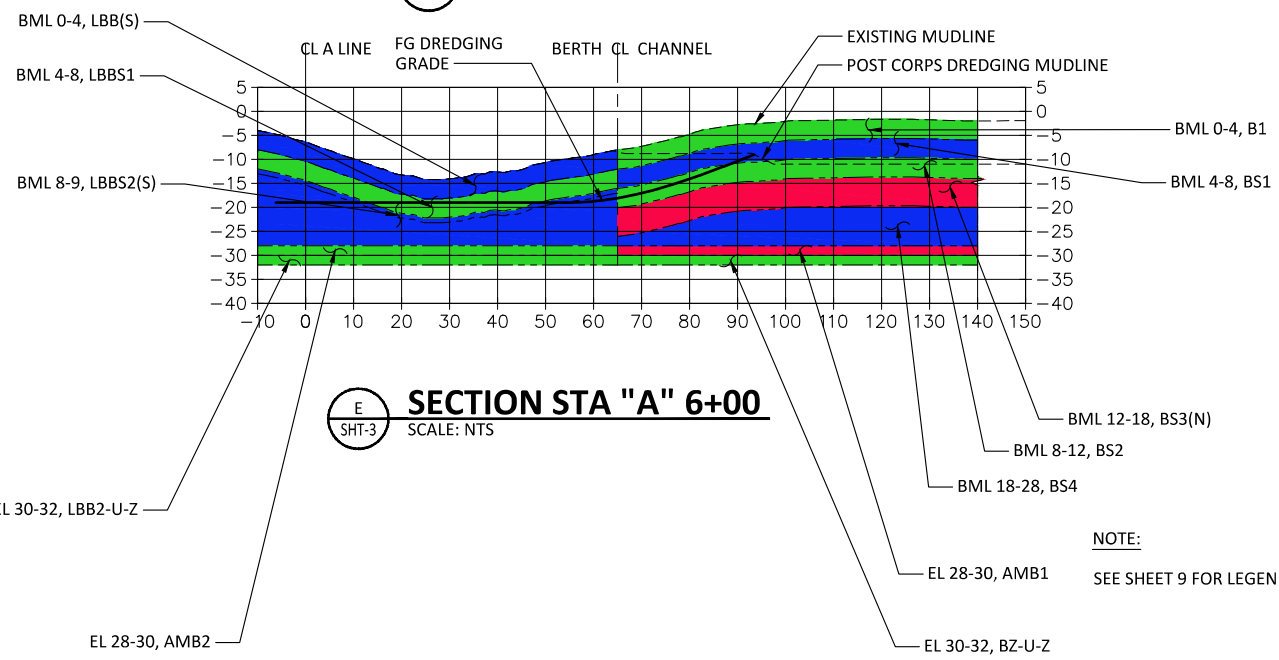
- DIOXIN / FURAN TEQ > 10mg/kg *
- DIOXIN / FURAN TEQ < 4-10mg/kg
- DIOXIN / FURAN TEQ < 4mg/kg

BML = BELOW MUDLINE
DMMU THICKNESS (FEET) = 0-4
LBBxx = DMMU IDENTIFICATION
DMMU = DREDGED MATERIAL MANAGMENT UNIT

* PER USACE SUITABILITY DETERMINATION NOVEMBER 2017



D SHT-3 **SECTION STA "A" 5+75**
SCALE: NTS



E SHT-3 **SECTION STA "A" 6+00**
SCALE: NTS

NOTE:

SEE SHEET 9 FOR LEGEND.

REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 ROEDER AVE.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

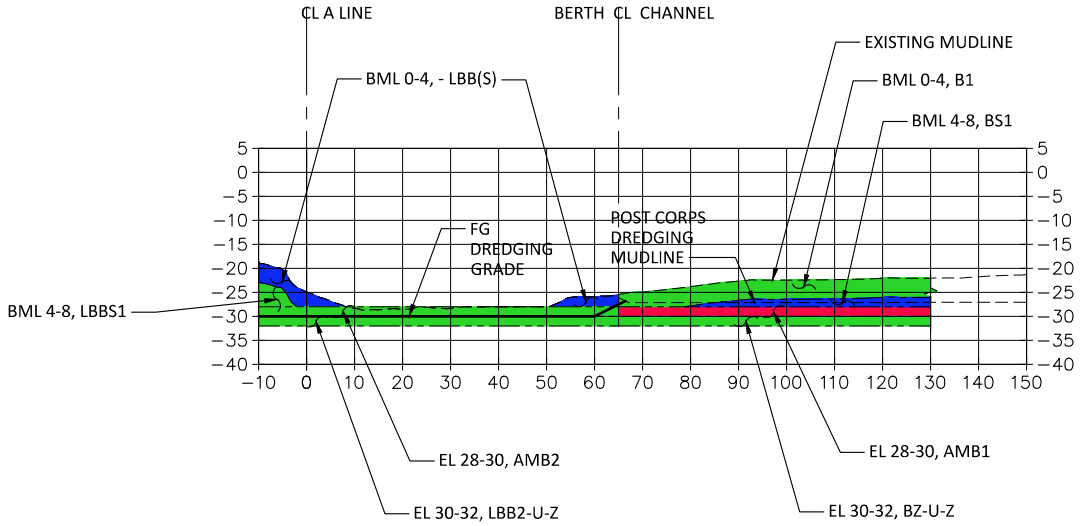
SHEET 10 of 13

Berth Maintenance Dredging

SHEET 10 : NORTH BERTH DREDGE SECTIONS

BCS BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: BELLINGHAM
COUNTY: Whatcom
LAT: 48° 45' 32.33" N
LONG: 122° 30' 38.24" N
DATUM: NAD 83
DATE: September 2017
Revised May 2019



F
SHT-3

SECTION STA "A" 7+00

SCALE: NTS

NOTE:

SEE SHEET 9 FOR LEGEND.

REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 ROEDER AVE.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

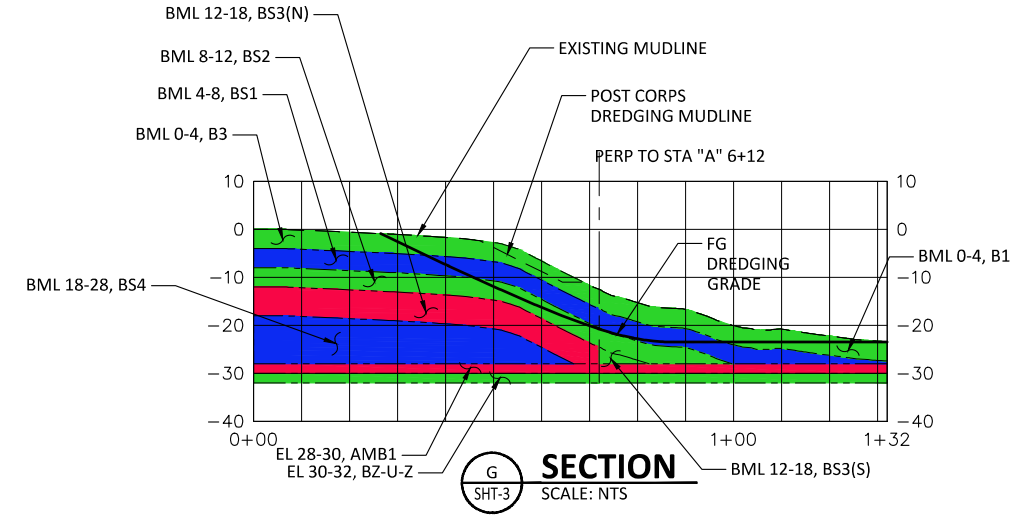
SHEET 11 of 13

Berth Maintenance Dredging

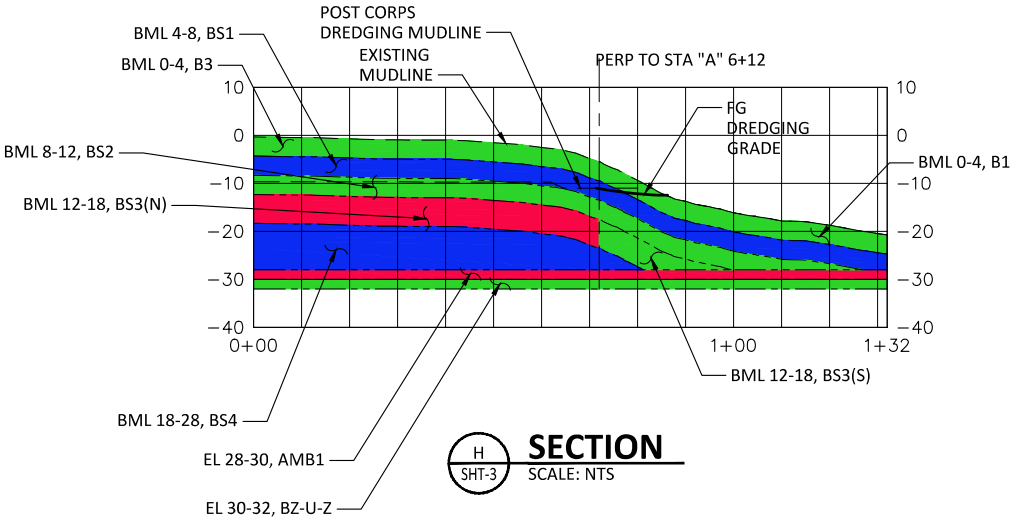
SHEET 11 : NORTH BERTH DREDGE SECTION

BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: BELLINGHAM
COUNTY: Whatcom
LAT: 48° 45' 32.33" N
LONG: 122° 30' 38.24" N
DATUM: NAD 83
DATE: September 2017
Revised May 2019



G SHT-3 **SECTION**
SCALE: NTS



H SHT-3 **SECTION**
SCALE: NTS

NOTE:

SEE SHEET 9 FOR LEGEND.

REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 ROEDER AVE.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

SHEET 12 of 13

Berth Maintenance Dredging

SHEET 12 : NORTH BERTH DREDGE SECTIONS

BCS BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
AT: BELLINGHAM
COUNTY: Whatcom
LAT: 48° 45' 32.33" N
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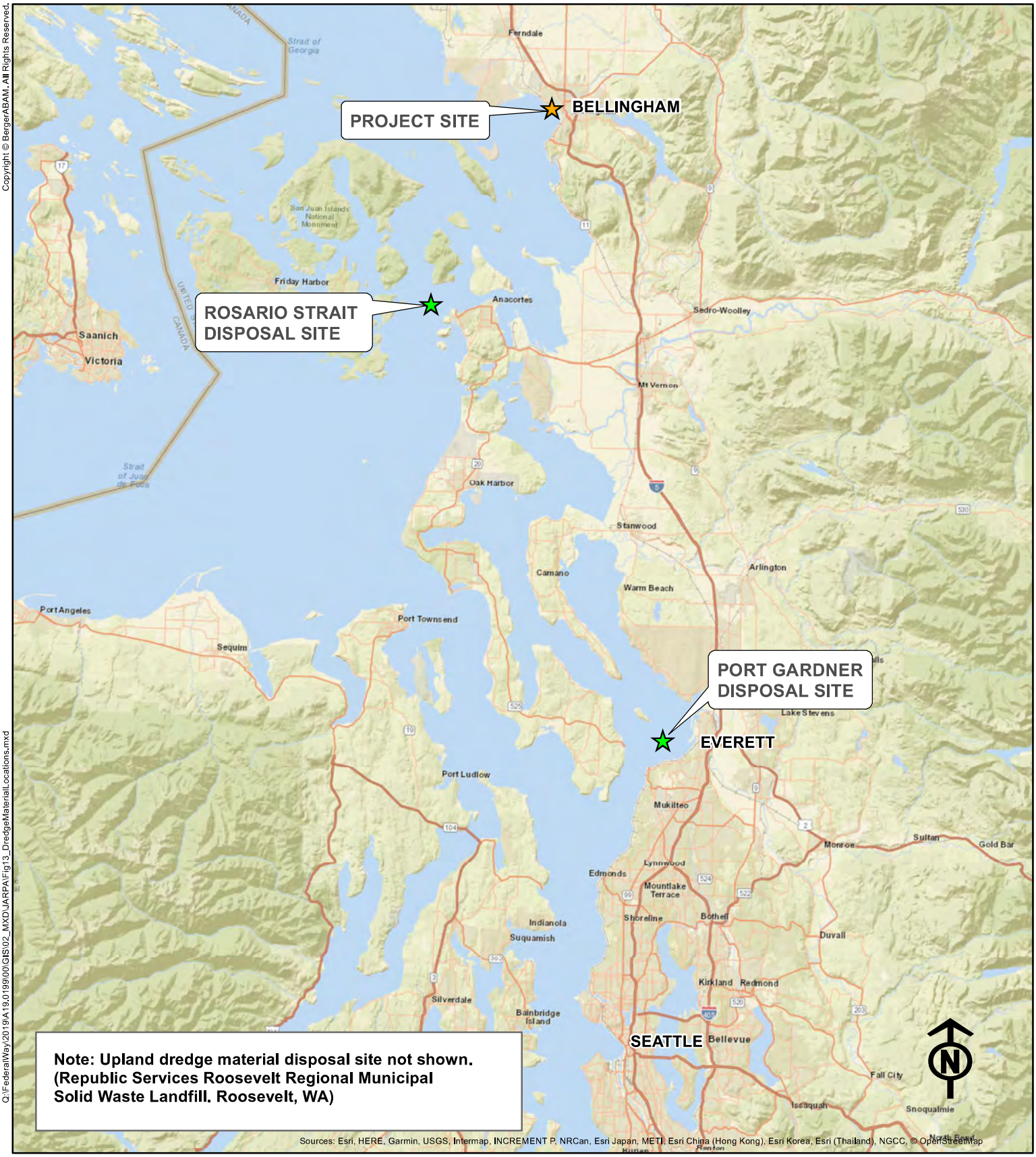
DATUM: NAD 83
DATE: September 2017
Revised May 2019



REFERENCE #: _____

APPLICANT: Bellingham Cold Storage
ADDRESS: 2825 Roeder Ave.
Bellingham, WA 98227

ADJACENT PROPERTY OWNERS:
1. Port of Bellingham

Sheet 13 of 13

Berth Maintenance Dredging

SHEET 13: DREDGE MATERIAL LOCATIONS

BCS
BELLINGHAM COLD STORAGE

PROPOSED PROJECT: Berth Maintenance Dredging to Accommodate Commercial Vessels
IN: Squalicum Waterway
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COUNTY: Whatcom
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DATE: September 2017
Revised May 2019

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